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(54) Title: HERBICIDAL PYRIMIDINES AND TRIAZINES**(57) Abstract**

This invention relates to certain herbicidal sulfonylure pyrimidines and triazines useful for complete control and/or selective control of vegetation with the selectivity being important to agronomic crops.

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TITLE

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HERBICIDAL PYRIMIDINES AND TRIAZINES

Related Applications

This is a continuation-in-part of U.S. Serial No. 07/542390 filed June 22, 1990 which is a continuation-in-part of U.S. Serial No. 07/463,356 10 filed January 11, 1990.

Background of the Invention

This invention relates to certain herbicidal pyrimidines and triazines, agriculturally suitable compositions thereof and a method for their use as 15 general or selective preemergent or postemergent herbicides or as plant growth regulants.

New compounds effective for controlling the growth of undesired vegetation are in constant demand. In the most common situation, such compounds 20 are sought to selectively control the growth of weeds in useful crops such as cotton, rice, corn, wheat and soybeans, to name a few. Unchecked weed growth in such crops can cause significant losses, reducing profit to the farmer and increasing costs to the 25 consumer. In other situations, herbicides are desired which will control all plant growth. Examples of areas in which complete control of all vegetation is desired are areas around railroad tracks, storage tanks and industrial storage areas. 30 There are many products commercially available for these purposes, but the search continues for products which are more effective, less costly and environmentally safe.

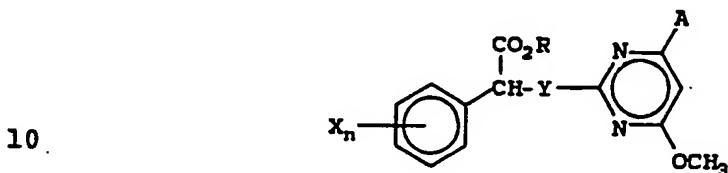
JP Kokai Hei 1[1989]-301668 discloses mandelic acid derivatives as herbicides:

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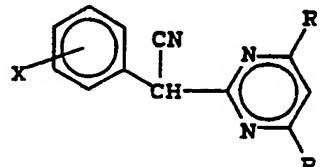
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J. Chem. Res. (S) 1977, 186 discloses benzyl pyrimidines as intermediates to herbicides but
15 includes no herbicidal test data for these intermediates.

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JP KOKAI HEI 2[1990]-56469 (unofficial English translation) discloses as herbicides the following
30 structures:

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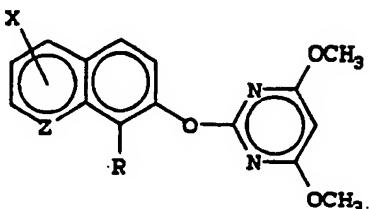
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wherein, inter alia

Z is CH or N;

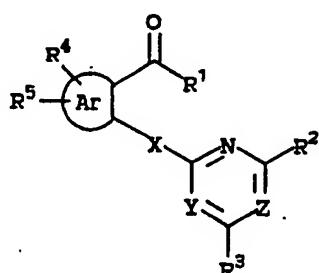
R is a formyl group or CO₂R¹; andR¹ is H, lower alkyl, lower alkoxyalkyl or lower alkylthioalkyl.

20

EP-A-360,163 discloses herbicidal compounds of the formula:

25

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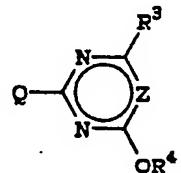
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SUMMARY OF THE INVENTION

5 This invention pertains to compounds of Formula I including all geometric and stereoisomers, agriculturally suitable salts, agricultural compositions containing them and their method-of-use for the control of unwanted weeds both preemergence
 10 and postemergence.

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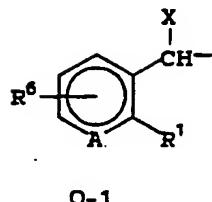
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I

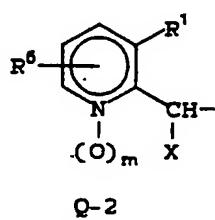
wherein

25 Q is

30



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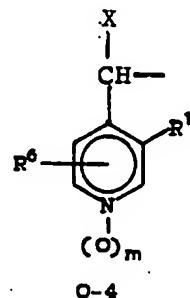
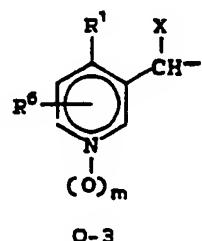
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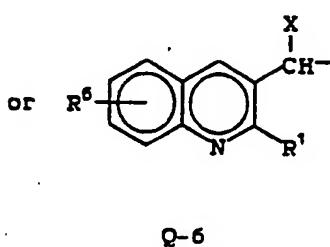
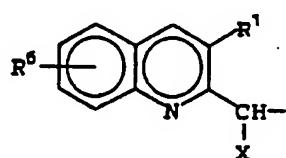
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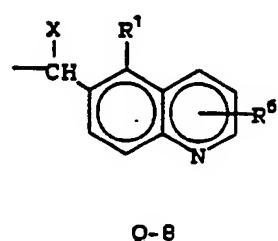
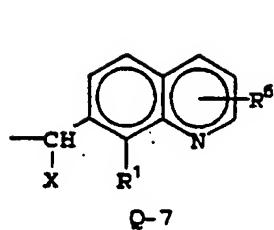
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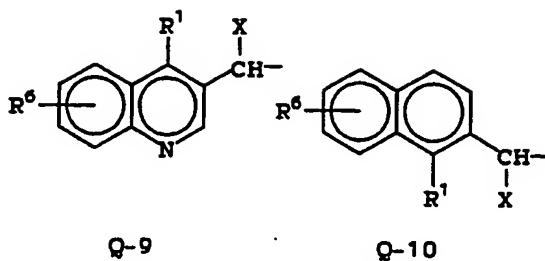
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A is CR², N or N-O;20 X is H, F, Cl, CH₃, OH, C(O)NR¹²R¹³, CO₂R¹⁴ or CN;R¹ is H, CHO, C(OCH₃)₂H, CO₂R⁵ or C(O)SR¹¹;R² is H, F, Cl, C₁-C₂ alkyl, C₁-C₂-alkoxy, C₂-C₃ alkynyl, C₂-C₃ alkenyl, S(O)_nC₁-C₂ alkyl, NO₂, phenoxy, C₂-C₄ alkylcarbonyl, C(OCH₃)₂CH₃, or C(SCH₃)₂CH₃;R³ is C₁-C₂ alkyl, C₁-C₂ alkoxy, OCF₂H or Cl;R⁴ is C₁-C₂ alkyl;R⁵ is H; M; C₁-C₃ alkyl; C₂-C₃ haloalkyl;30 allyl; propargyl; benzyl optionally substituted with halogen, C₁-C₂ alkyl, C₁-C₂ alkoxy, CF₃, NO₂, SCH₃, S(O)CH₃, or S(O)₂CH₃; C₂-C₄ alkoxyalkyl; N=CR⁷R⁸; or CHR⁹S(O)_nR¹⁰;35 R⁶ is H, F, Cl, CH₃, OCH₃ or S(O)_nCH₃;

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R⁷ is Cl, C₁-C₂ alkyl or SCH₃;
R⁸ is C₁-C₂ alkyl, CO₂(C₁-C₂ alkyl) or
C(O)N(CH₃)₂;

5 R⁹ is H or CH₃;

R¹⁰ is C₁-C₃ alkyl or phenyl optionally
substituted with halogen, CH₃, OCH₃ or NO₂;

R¹¹ is C₁-C₂ alkyl or benzyl;

10 R¹² is H or CH₃;

R¹³ is H or CH₃;

R¹⁴ is H, C₁-C₃ alkyl, C₂-C₅ haloalkyl, C₃-C₅
alkenyl, C₃-C₅ alkynyl, C₂-C₅ alkoxyalkyl or
benzyl optionally substituted with CH₃,

15 OCH₃, SCH₃, halogen, NO₂ or CF₃;

m is 0 or 1;

n is 0, 1 or 2;

M is a alkali metal atom or an alkaline earth
metal atom, an ammonium group or an
alkylammonium group; and

20 Z is CH or N.

and their agriculturally suitable salts;

provided that:

25 (a) when R¹ is H, then X is CO₂R¹⁴;

(b) when X is CO₂R¹⁴, then R¹ is H; and

(c) when Z is N, then R³ is C₁-C₂ alkyl or
C₁-C₂ alkoxy.

In the above definitions, the term "alkyl",
30 used either alone or in compound words such as
"haloalkyl" includes straight chain or branched
alkyl, e.g., methyl, ethyl, n-propyl, isopropyl or
the different butyl isomers.

35 "Alkoxy", "alkenyl" and "alkynyl" analogously
also includes straight chain or branched isomers.

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"Halogen", either alone or in compound words
5 such as "haloalkyl", means fluorine, chlorine,
bromine or iodine. Further, when used in compound
words such as "haloalkyl" said alkyl may be partially
or fully substituted with halogen atoms, which may be
the same or different. Examples include CF_3 , CH_2CF_3 ,
10 $\text{CH}_2\text{CH}_2\text{F}$, CF_2CF_3 and CH_2CHFCl .

The preferred compounds of the invention for
reasons including ease of synthesis and/or greater
herbicidal efficacy are:

15 1. Compounds of Formula I wherein
Q is Q-1 or Q-2;

20 2. Compounds of Preferred 1 wherein
 R^2 is H, F, Cl, CH_3 , SCH_3 , OCH_3 or OCH_2CH_3 ;
25 3. Compounds of Preferred 2 wherein
 R^6 is H;
Z is CH;
 R^3 is OCH_3 ;
 R^4 is CH_3 ; and
X is H;

30 4. Compounds of Preferred 2 wherein
 R^6 is H or 3-F;
Z is CH;
 R^3 is OCH_3 ;
 R^4 is CH_3 ;
X is CO_2R^{14} ; and
 R^{14} is $\text{C}_1\text{-C}_3$ alkyl, allyl, propargyl or
35 benzyl;

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5. Compounds of Preferred 3 wherein

Q is Q-1;

5 R¹ is CO₂R⁵; andR⁵ is H or M;6. Compounds of Preferred 3 wherein

Q is Q-2;

10 R¹ is CO₂R⁵; andR⁵ is H or M;15 7. The compound of Preferred 5 which is2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-
6-methyl-benzoic acid;20 8. The compound of Preferred 2 which is2-[cyano(4,6-dimethoxy-2-pyrimidinyl)methyl]-
benzoic acid;25 9. The compound of Preferred 5 which is2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-6-
methyl benzoic acid, sodium salt;30 10. The compound of Preferred 5 which is2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-
3-pyridine carboxylic acid;11. The compound of Preferred 4 which is ethyl4,6-dimethoxy-alpha-phenyl-2-
pyrimidineacetate.

The compounds of this invention are biologically active as herbicides both post and preemergent with

35 selectivity to crops including barley, wheat, corn and cotton.

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Detailed Description of the Invention
Synthesis

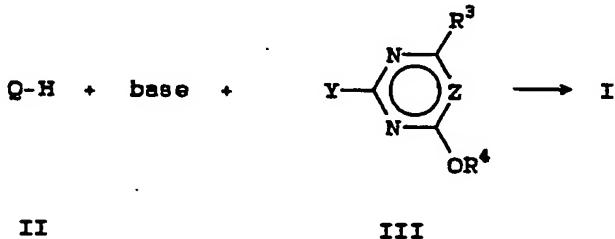
5 The compounds of Formula I can be prepared by one or more of the following methods described in Equations 1 to 4.

10 The compounds of Formula I can be prepared by the reaction of an anion, formed from intermediate II and a base, with heterocycle III as shown in Equation 1.

Equation 1

15

20



25

wherein:

Q-1 to Q-6, Z, R³ and R⁴ are as previously defined;

30 Y is Cl, Br, I, SO₂CH₃ and SO₂benzyl; and within the values of Q, R¹ is C(OMe)₂H, CH₂OH, CO₂R⁵ or C(O)N(H, alkyl)(alkyl, silylalkyl); and

X is H.

35 The reaction wherein a benzylic anion is formed, is best carried out in a dry inert solvent

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such as hexane, benzene, diethyl ether or tetrahydrofuran (THF). Appropriate bases include hindered amine bases, such as lithium diisopropylamide (LDA) or alkyllithiums, such as methyllithium or magnesium salts, such as ethyl magnesium bromide. When R¹ contains an acidic group, a second equivalent base is required. Formation of benzylic anions is further taught by Y. Thebtaranonth et al in Synthesis, 1986, 785; in Tet. Let., 1989, 30, 3861; J. Staunton et al. in J. Chem. Soc. Perkin Trans. I, 1984, 1043-1051, and F. Hauser et al. Synthesis, 1980, 72. The reaction can be carried out from low temperatures -78°C (dry ice/acetone) up to the reflux point of the solvent. Generally, a lower temperature is preferred for anion formation, while the coupling of the anion II and III proceeds readily at higher temperatures.

When the reaction is judged complete, it is worked up in one of two manners, depending on the R¹ group. If R¹ contains an acidic group such as CO₂H, then the reaction is extracted into aqueous base, and the water layer acidified. Alternately, the carboxylate can be alkylated *in situ* to give an alkyl or benzyl ester. The product is either collected by filtration or extracted with an organic solvent and concentrated. The residue is further purified by trituration, crystallization or chromatography in the appropriate solvent. If the R¹ group contains no acidic group, i.e., an isopropylester, then the reaction is quenched with brine, the organic layer separated and concentrated followed by the appropriate purification to give the desired product.

The compounds of Formula I can be prepared by the reaction of a cyanomethyl derivative IV with

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5 heterocycle III as shown in Equation 2a followed by oxidation, then reduction to give the alcohol, which can be converted to the halomethyl derivative (X is F or Cl), or further reduced to the methylene derivative (X is H).

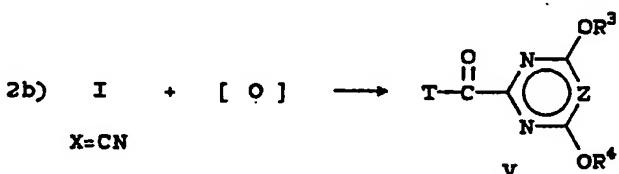
Equation 2

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IV X=CN

15



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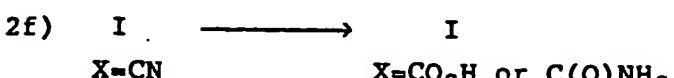


X=OH

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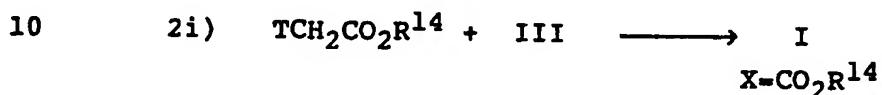
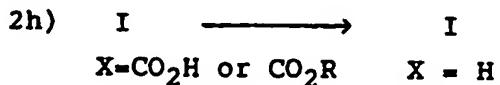
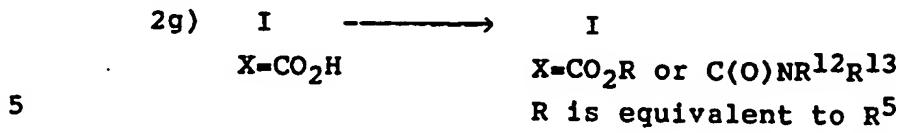


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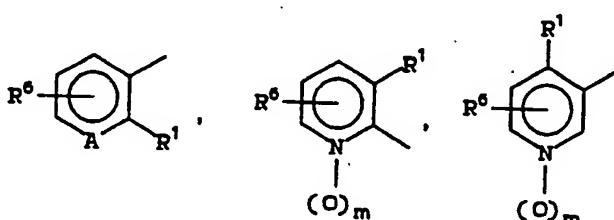


wherein:

T is

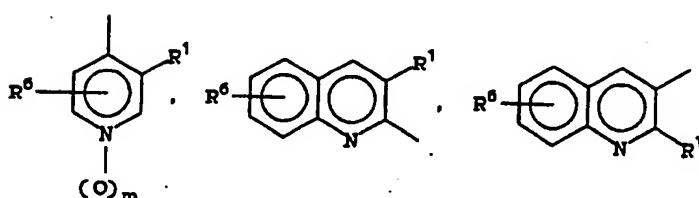
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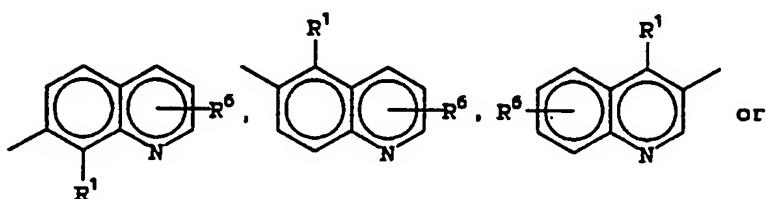
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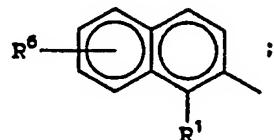
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R^1 is $C(OMe)_2H$, Br, CN, $CH_2OSiMe_2CMe_3$ or CO_2R^5 ;
 R^5 is H, M, $CHMe_2$ or CMe_3 ; and
 30 A and R^6 are as previously defined.

The reaction of Equation 2a wherein Y is Cl or Br can be conveniently carried out under $S_{RN}I$ conditions by preparing a mixture of one equivalent 35 or more of potassium metal, a catalytic amount of an iron compound, i.e., ferric nitrate, in liquid

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ammonia. The arylacetonitrile **IV** is added followed by the dropwise addition of the haloheterocycle **III**, 5 with concomitant irradiation from a photoreactor lamp which emits maximally at 350 nm. The reaction is irradiated from 1 to 24 hours, then the reaction is quenched with solid ammonium chloride, the ammonia is allowed to slowly evaporate. The residual material 10 is rinsed with diethylether and the filtrate is subjected to purification by recrystallization or chromatography to give the desired product. Procedures can be adapted from J. F. Wolfe et al., J. Het. Chem., 1987, 24, 1061.

15 Alternatively, the reaction of Equation 2a, wherein Y is Cl, Br, I, CH_3SO_2 or PhCH_2SO_2 , is carried out under basic conditions.

The starting materials can be premixed in an inert solvent such as diethylether, THF or 20 dimethylformamide (DMF) solvent when Y is halogen, followed by addition of a strong base, such as an alkali metal hydride, i.e., NaH, or a hindered metallated base, i.e., LDA or potassium t-butoxide. Another order of addition for any Y value can be the 25 formation of the anion of acetonitrile **IV** in an inert solvent, followed by its addition to the heterocycle in an inert solvent. Yields are generally increased with the use of dry solvents and dry inert atmospheres, with temperatures that range from -78°C 30 to the solvent reflux point. The reaction is neutralized and the product is isolated by chromatography or crystallization. Analogous reactions are taught by R. Y. Ning et al., J. Med. Chem., 1977, 20, 1312 and F. Sauter et al., J. Chem. Res. (S), 1977, 186.

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Reactions 2a and 2b can be carried out concurrently by allowing the reaction to be exposed to oxygen in the atmosphere. The oxidation of I (X is CN) to a diaryl ketone Y can be carried out by one of several procedures. S. Murahashi et al., Syn. Lett., 1989, 62, teach the oxidation of alkanenitriles with ruthenium catalyzed t-butyl hydroperoxide to give intermediate 2-(t-butyldioxy)-alkanenitriles, which are further oxidized by titanium tetrachloride.

Diarylketones Y can be reduced directly to the diarylmethanes via Equation 2e by Wolff-Kishner conditions as taught by Cram et al., J. Am. Chem. Soc., 1962, 84, 1734; Clemmensen conditions as taught by Yamamura and Hirata, J. Chem. Soc. C, 1968, 2887; or hydrogenation with a catalyst such as $CuCr_2O_4$.

The diarylketones Y can also be reduced stepwise to the alcohol, I ($X=OH$), with lithium aluminum hydride or sodium borohydride. The alcohol can be converted to the chloride with thionyl chloride or methanesulfonyl chloride and triethylamine and to the fluoride with "DAST" (diethylaminosulfur trifluoride), see Synthesis, 1973, 787 and J. Org. Chem., 1975, 40, 574, as shown in Equations 2c and 2d.

Cyanomethanes of Formula I ($X=CN$) can be converted to carboxylic acids and amides by hydrolysis with either base or acid, as shown in Equation 2f.

Carboxylic acids I ($X=CO_2H$) can be esterified or converted to amides by methods well known to a chemist skilled in the art.

Equation 2h shows that compounds of Formula I ($X=CO_2R$) can be decarboxylated to the methylene

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5 bridged compounds. Such decarboxylations are well known in the art and generally are accomplished by heating the compound with or without solvent and with or without a catalyst.

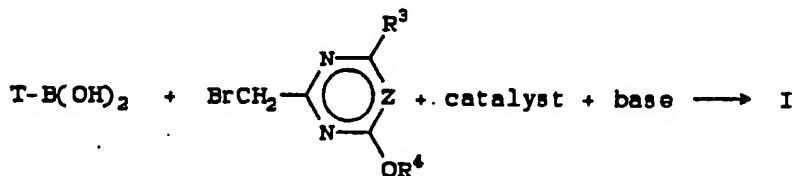
Equation 2i is carried out in a similar fashion to 2a wherein an appropriate base is reacted with the aryl acetate followed by addition of heterocycle III.

10 The cyanomethanes and arylacetates of Formula IV are either known in the art or prepared by simple modifications thereof. Cyanomethanes are most conveniently prepared by nucleophilic reaction of a metal cyanide, i.e., NaCN, with a benzyl halide in a
 15 suitable solvent, such as dimethylformamide, dimethylsulfoxide or THF. The benzyl halides are also well known, and easily prepared from II by methods adapted from T. Eicher, *Synthesis*, 1988, 1,
 525 and Clarke et al., *J. Chem. Perkin Trans. I*,
 20 1984, 1501.

The compounds of Formula I can be prepared by a cross-coupling reaction between an aryl boronic acid and a bromomethyl heterocycle with a catalyst as shown in Equation 3.

25 Equation 3

30



35

VI

VII

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18

wherein:

5 T, Z, R³ and R⁴ are as previously defined;
R¹ is C(OMe₂)H, CH₂OH, CO₂R⁵ or CON(H,CH₃)-
(alkyl, alkylsilyl); and
R⁵ is H, M, isopropyl or t-butyl.

The reaction is carried out by mixing the
10 bromide (VII) with a transition metal catalyst, such
as Ni(O) or Pd(O), preferably Pd(PPh₃)₄ in a suitable
solvent, such as toluene or glyme, followed by the
addition of boronic acid VI and the base, such as an
alkoxide, hydroxide or carbonate, for example NaOEt,
15 NaOH or Na₂CO₃ in a suitable solvent such as water or
ethanol. The reaction mixture is stirred from 1 to
24 hours at room temperature to reflux. At
completion, the reaction is filtered, and the
filtrate is concentrated. The residue is partitioned
20 between brine and an organic solvent (EtOAc, CH₂Cl₂),
separated, dried (Na₂SO₄, MgSO₄), and concentrated,
whereupon the product is isolated and purified, if
necessary, by flash chromatography, recrystallization
or distillation. Similar procedures and
25 modifications can be found in Snieckus et al.,
Tet. Let., 1987, 28, 5093; ibid., 1985, 26, 5997;
Yamamoto et al., Synthesis, 1986, 564; Suzuki et al.
Synth. Comm., 1981, 11, 513 and references
incorporated therein.
30 Formation of aryl boronic acids, VI, is well
known in the art. They can be prepared by contacting
an aryl organo metallic compound with B(OMe)₃
followed by acidic workup, as in J. Org. Chem., 1984,
49, 5237 and Tetrahedron, 1983, 39, 1955; or by
35 reaction of an arylsilane with BBr₃, followed by

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addition of methanol, then dilute acid, as described in Tet. Let., 1987, 28, 5093.

5 Bromomethanes VII can be prepared by well known methods for conversion from alcohols and from methyl groups. A representative example is described in J. Het. Chem., 1989, 26, 913.

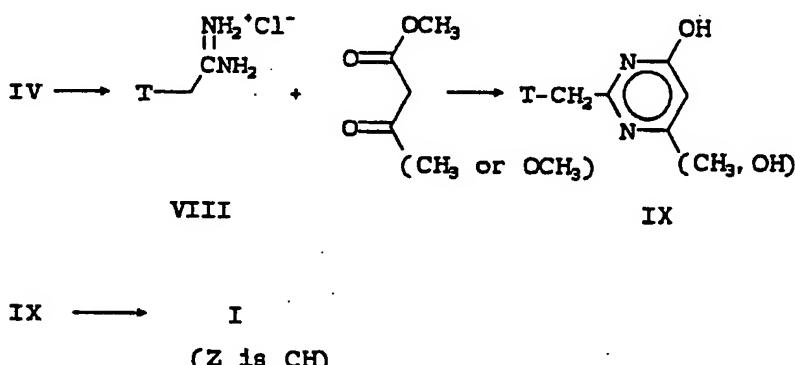
10 Compounds of Formula I, wherein Z is CH, can be prepared by the route shown in Equation 4.

Equation 4

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The reaction is carried out by reacting IV with 30 hydrogen chloride in an alcohol to form an imidate which is converted to the amidine salt, VIII, with ammonia. The pyrimidinol IX is formed by condensation with a diketone/ester. This sequence of reactions and similar modifications can be found in 35 H. C. van der Plas et al., Tetrahedron, 1989, 45, 6511-6518. Compounds of Formula IX can be converted

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to instant compounds I by preparation of the chloropyrimidine with phosphorus oxychloride and a 5 catalytic amount of DMF and subsequent displacement with sodium methoxide or ethoxide.

Heterocycles of Formula III are generally known in the art or can be prepared by simple modifications thereof. For example, preparation of chlorotriazines 10 is described in J. Am. Chem. Soc., 1951, 73, 2989, while chloropyrimidines are described in J. Chem. Soc. (C), 1966, 2031. General references, particularly to aminoheterocycles, can be found in "The Chemistry of Heterocyclic Compounds", a series 15 published by Interscience Publishers, Inc., New York and London. The alkylsulfonyl and benzylsulfonyl heterocycles can also be prepared by the general reference above and more specifically by alkylation of thiols, as described in J. Med. Chem., 1984, 27, 20 1621-1629, followed by oxidation, most commonly by m-chloroperoxybenzoic acid.

The arylmethanes of Formula II are known in the art or easily prepared by methods therein.

The R¹ groups of Equations 1 to 4 can be 25 converted into the claimed R¹ groups by techniques well known to one skilled in the art. For example, benzyl alcohols can be oxidized to aldehydes with many reagents, including pyridinium chlorochromate (PCC) and/or further oxidized to the carboxylate with 30 potassium permanganate (KMnO₄). A sample procedure involving a phase transfer reagent is found in Can. J. Chem., 1989, 67, 1381.

Additionally, conversion to and from various preferred R¹ groups are well known to one skilled in 35 the art. Many are described in T. Greene, Protective

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Groups in Organic Synthesis, 1981, John Wiley and Sons, New York.

5 Carboxylic acid salts of Formula I (R^1 is CO_2M) can be prepared by reacting the carboxylic acid of Formula I (R^1 is CO_2H) with a base in the presence or absence of a solvent within a temperature range from room temperature to the boiling point of the solvent
10 from 5 minutes to 24 hours. The solvent may be a hydrocarbon such as benzene or toluene, a halogenated hydrocarbon such as methylene chloride or chloroform, an alcohol such as methanol, ethanol or isopropanol, and other solvents, such as ethyl ether, THF,
15 acetone, methyl ethyl ketone, ethyl acetate or acetonitrile. The base may be an alkali metal such as sodium metal or potassium metal, an alkali metal or alkaline earth metal hydride such as sodium hydride, potassium hydride or calcium hydride, a
20 carbonate such as sodium carbonate, potassium carbonate or calcium carbonate, or a metal hydroxide such as sodium hydroxide or potassium hydroxide. The organic base may be ammonia, an alkylamine (primary amine), a dialkylamine (secondary amine) or a
25 trialkylamine (tertiary amine).

Example 1

2-[(4,6-Dimethoxy-2-pyrimidinyl)methyl]-6-methylbenzoic acid

30 To a cooled ($15^\circ C$) suspension of sodium hydride (8.79 g, 0.183 mol), prewashed with dry hexanes, in 300 mL anhydrous THF under an N_2 atmosphere was added 2,6-dimethylbenzoic acid (24.5 g, 0.166 mol), portionwise. Additional THF (300 mL) was added to
35 facilitate stirring in the resultant slurry. Then 142 mL of 1.4 M methyllithium (0.199 mol) was added

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dropwise at room temperature. One-twelfth of the resultant red solution (50 mL, 0.0138 mol), was added 5 to 1.50 g of 4,6-dimethoxy-2-(methylsulfonyl)-pyrimidine (0.068 mol) under N₂ at room temperature. After 4 hours, the reaction was diluted with 100 mL 1N HCl and 100 mL brine. The layers were separated; the aqueous layer was extracted with 100 mL ethyl acetate. The combined organic layers were dried 10 (MgSO₄), filtered and concentrated to give 2.5 g of a yellow oil. Addition of Et₂O gave a small amount of white precipitate, which was removed by filtration. The filtrate was subjected to flash column 15 chromatography (40 mm x 6" of SiO₂), eluted with 25% ethyl acetate/hexanes (v/v), initially, then 50:49:1 ethyl acetate in hexane/methanol. The fractions containing product were collected and concentrated under reduced pressure. The resultant oil 20 crystallized on standing to give 0.41 g solid, m.p. 122-124°C.

IR (nujol) = 1710 cm⁻¹.

Mass Spec. m/e = 289 (100, M+1).

PMR (200 MHz, CDCl₃) δ 2.49 (s, CH₃, 3H), 3.5-3.9. 25 (bs, OH, 1H), 3.93 (s, OCH₃, 6H), 4.15 (s, CH₂, 2H), 5.91 (s, pyrm-H, 1H), 7.0-7.3 (m, ArH, 3H).

Example 22-[Cyano(4,6-dimethoxy-2-pyrimidinyl)methyl]-30 benzoic acid

a) To a suspension of 60% NaH (0.38 g, prewashed with hexanes) in 50 mL dry THF was simultaneously added methyl 2-cyanomethylbenzoate (1.6 g) and 35 4,6-dimethoxy-2-methylsulfonylpyrimidine (1.99 g) in dry THF. After addition, the reaction was refluxed

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for 2 days, then 1.0 g of potassium t-butoxide was added. After 1 day, the reaction was quenched with
5 25 mL of brine and neutralized with 1 N HCl. The organic layer was concentrated under reduced pressure to give 2.87 g of an oil. The oil was subjected to flash column chromatography (SiO_2), eluted with EtoAc/hexane (1:9) to give 0.75 g of solid, m.p.

10 79-81°C.

PMR (200 MHz, CDCl_3) δ 3.86 (s, OCH_3 , 6H), 3.90 (s, OCH_3 , 3H), 5.89 (s, pyrm-H, 1H), 6.74 (s, CHCN, 1H), 7.35-8.05 (m, ArH, 4H).

15 b) The product of 2a (0.43 g) was dissolved in a solution of 1.6 mL of 12% aqueous NaOH and 12 mL of ethanol. After 12 hours, the reaction mixture was diluted with 15 mL of .4 M NaOH and washed with Et_2O . The aqueous layer was acidified, then
20 extracted with EtOAc. The organic layer was concentrated under reduced pressure and the residue was triturated with butyl chloride to give 0.15 g solid, m.p. 214-216°C.

NMR (90 MHz, CDCl_3) δ 3.9 (s, OCH_3), 6.0 (s, pyrm-H, 1H), 6.9 (s, CHCN, 1H), 7.4-8.3 (m, ArH, 4H), 11.0 (bs, CO_2H , 1H).

Example 3

2-[4,6-Dimethoxy-2-pyrimidinyl]methyl-3-pyridinecarboxylic acid

To a cooled (-78°C) suspension of 2-methylnicotinic acid (1.4 g, 10.2 mmol) in 100 mL dry THF was added 11.25 mL 1.95 M LDA dropwise. The reaction turned purple and warmed to -65°C. Allowed
35 to recool to -78°C, then added 2-chloro-4,6-dimethoxy-pyrimidine (1.75 g, 10 mmol). The reaction was

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allowed to warm to room temperature over 2 days. The solvent was removed under reduced pressure. The residue was partitioned between Et₂O and water, which was basified to pH 8-9. The aqueous layer was acidified, then extracted with EtOAc, dried (MgSO₄), and concentrated under reduced pressure to give 1.33 g of a brown oil. This oil was subjected to flash column chromatography on SiO₂, eluted with 97:2:1 (EtOAc:MeOH:HOAc), to give after trituration with BuCl/hexanes a solid, 0.29 g, m.p. 182-186°C. Mass Spec.: m/e 276 (100, MH⁺). PMR (acetone-d₆, 200 MHz) δ 3.8 (s, OMe, 6H), 4.8 (s, CH₂, 2H), 5.9 (s, pyrm-H, 1H), 7.4 (m) + 8.3 (m) + 8.7 (m) [pyrH, 3x 1H].

Example 4

4,6-Dimethoxy-α-phenyl-2-pyrimidineacetic acid, ethyl ester.

To a cooled (-78°C) solution of ethyl phenyl-acetate (0.79 ml, 5mmol) in 30 mL anhydrous THF under an N₂ atmosphere was added 2.86 mL of 1.9M LDA dropwise, followed by 1.0 g of 4,6-dimethoxy-2-methylsulfonylpyrimidine. The reaction mixture was allowed to warm to room temperature over 6 h then quenched with 20 mL brine and 5 mL of 1 NHCl. The layers were separated and the aqueous layer was extracted with ethyl acetate. The combined organic layers were washed once with brine, dried (MgSO₄), filtered and concentrated under reduced pressure to give 1.6 g of a brown oil. The oil was subjected to flash column chromatography (SiO₂), eluted with Et₂O/hexanes (1:9) to give 0.63g of the product as an oil. PMR (200 MHz, CDCl₃) δ 1.24 (t, CH₃, 3H), 3.89

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(s, OCH₃, 6H), 5.08 (s, CH, 1H), 5.89 (s, pyrmH, 1H),
7.2-7.6 (m, ArH, 5H).

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Using the procedures of Equations 1 to 4 and Examples 1 to 4, the compounds of Tables 1 to 7 can be prepared by one skilled in the art.

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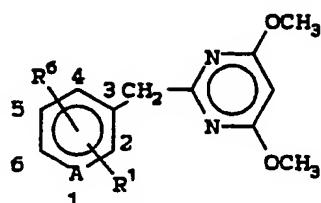
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TABLE 1

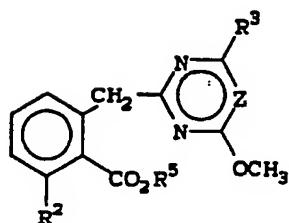
A	R ¹	R ⁶	A	R ¹	R ⁶
N	2-CHO	H	CH	2-CHO	H
N	2-CHO	4-Cl	CCH ₃	2-CHO	H
N	2-CO ₂ H	H	CCl	2-CHO	H
N	2-CO ₂ H	4-F	COCH ₃	2-CHO	H
N	2-CO ₂ H	5-OCH ₃	CH	2-CHO	4-F
N	2-CO ₂ H	6-SCH ₃	CH	2-CO ₂ H	4-F
N	2-CO ₂ CH ₃	H	CH	2-CO ₂ H	4-OCH ₃
N	2-CO ₂ CH ₂ CH=CH ₂	H	CH	2-CO ₂ H	4-OCH ₂ CH ₃
N	2-CO ₂ CH ₂ C≡CH	H	CC(OMe) ₂ CH ₃	2-CO ₂ H	H
N	2-CO ₂ CH ₂ C ₆ H ₅	H	COC ₆ H ₅	2-CO ₂ H	H
N	2-CO ₂ CH ₂ -3-Cl-C ₆ H ₄	H	CH	2-CO ₂ CH ₃	4-Cl
N	2-CO ₂ Na	H	CH	2-CO ₂ CH ₃	4-SCH ₃
N	2-CO ₂ H-NH ₂ CHMe ₂	H	CH	2-CO ₂ CH ₃	6-SO ₂ CH ₃
N-O	2-CO ₂ H	H	CH	2-CO ₂ CH ₃	5-Cl
N	4-CHO	H			
N	4-CO ₂ H	H			
N	4-CO ₂ Na	H			
N	4-CO ₂ H	5-Cl			

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TABLE 2



R^5	R^2	R^3	Z	R^5	R^2	R^3	Z
H	H	CH ₃	CH	H	OCH ₂ CH ₃	OCH ₃	CH
H	H	Cl	CH	H	C≡CH	CH ₃	CH
H	H	OCH ₃	CH	H	C≡CH	Cl	CH
H	F	CH ₃	CH	H	C≡CH	OCH ₃	CH
H	F	Cl	CH	H	SCH ₃	CH ₃	CH
H	F	OCH ₃	CH	H	SCH ₃	Cl	CH
H	Cl	CH ₃	CH	H	SCH ₃	OCH ₃	CH
H	Cl	Cl	CH	H	H	CH ₃	N
H	Cl	OCH ₃	CH	H	H	CH ₂ CH ₃	N
H	CH ₃	CH ₃	CH	H	H	OCH ₃	N
H	CH ₃	Cl	CH	H	F	CH ₃	N
H	CH ₃	OCH ₃	CH	H	F	CH ₂ CH ₃	N
H	CH ₂ CH ₃	CH ₃	CH	H	F	OCH ₃	N
H	CH ₂ CH ₃	Cl	CH	H	Cl	CH ₃	N
H	CH ₂ CH ₃	OCH ₃	CH	H	Cl	CH ₂ CH ₃	N
H	OCH ₃	CH ₃	CH	H	Cl	OCH ₃	N
H	OCH ₃	Cl	CH	H	CH ₃	CH ₃	N
H	OCH ₃	OCH ₃	CH	H	CH ₃	CH ₂ CH ₃	N
H	OCH ₂ CH ₃	CH ₃	CH	H	CH ₃	OCH ₃	N
H	OCH ₂ CH ₃	Cl	CH	H	CH ₂ CH ₃	CH ₃	N

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R ⁵	R ²	R ³	Z	R ⁵	R ²	R ³	Z
H	CH ₂ CH ₃	CH ₂ CH ₃	N	H	SOCH ₃	CH ₂ CH ₃	N
H	CH ₂ CH ₃	OCH ₃	N	H	SOCH ₃	OCH ₃	N
H	OCH ₃	CH ₃	N	H	SO ₂ CH ₃	CH ₃	N
H	OCH ₃	CH ₂ CH ₃	N	H	SO ₂ CH ₃	CH ₂ CH ₃	N
H	OCH ₃	OCH ₃	N	H	SO ₂ CH ₃	OCH ₃	N
H	OCH ₂ CH ₃	CH ₃	N	H	SO ₂ CH ₂ CH ₃	CH ₃	N
H	OCH ₂ CH ₃	CH ₂ CH ₃	N	H	SO ₂ CH ₂ CH ₃	CH ₂ CH ₃	N
H	OCH ₂ CH ₃	OCH ₃	N	H	SO ₂ CH ₂ CH ₃	OCH ₃	N
H	C≡CH	CH ₃	N	H	OC ₆ H ₅	CH ₃	N
H	C≡CH	CH ₂ CH ₃	N	H	OC ₆ H ₅	CH ₂ CH ₃	N
H	C≡CH	OCH ₃	N	H	OC ₆ H ₅	OCH ₃	N
H	SCH ₃	CH ₃	N	CH ₃	H	CH ₃	CH
H	SCH ₃	CH ₂ CH ₃	N	CH ₃	H	Cl	CH
H	SCH ₃	OCH ₃	N	CH ₃	H	OCH ₃	CH
H	SCH ₂ CH ₃	CH ₃	CH	CH ₃	F	CH ₃	CH
H	SCH ₂ CH ₃	Cl	CH	CH ₃	F	Cl	CH
H	SCH ₂ CH ₃	OCH ₃	CH	CH ₃	F	OCH ₃	CH
H	SOCH ₃	CH ₃	CH	CH ₃	Cl	CH ₃	CH
H	SOCH ₃	Cl	CH	CH ₃	Cl	Cl	CH
H	SOCH ₃	OCH ₃	CH	CH ₃	Cl	OCH ₃	CH
H	SO ₂ CH ₃	CH ₃	CH	CH ₃	CH ₃	CH ₃	CH
H	SO ₂ CH ₃	Cl	CH	CH ₃	CH ₃	Cl	CH
H	SO ₂ CH ₃	OCH ₃	CH	CH ₃	CH ₃	OCH ₃	CH
H	SO ₂ CH ₂ CH ₃	CH ₃	CH	CH ₃	CH ₂ CH ₃	CH ₃	CH
H	SO ₂ CH ₂ CH ₃	Cl	CH	CH ₃	CH ₂ CH ₃	Cl	CH
H	SO ₂ CH ₂ CH ₃	OCH ₃	CH	CH ₃	CH ₂ CH ₃	OCH ₃	CH
H	OC ₆ H ₅	CH ₃	CH	CH ₃	OCH ₃	CH ₃	CH
H	OC ₆ H ₅	Cl	CH	CH ₃	OCH ₃	Cl	CH
H	OC ₆ H ₅	OCH ₃	CH	CH ₃	OCH ₃	OCH ₃	CH
H	SCH ₂ CH ₃	CH ₃	N	CH ₃	OCH ₂ CH ₃	CH ₃	CH
H	SCH ₂ CH ₃	CH ₂ CH ₃	N	CH ₃	OCH ₂ CH ₃	Cl	CH
H	SCH ₂ CH ₃	OCH ₃	N	CH ₃	OCH ₂ CH ₃	OCH ₃	CH
H	SOCH ₃	CH ₃	N	CH ₃	C≡CH	CH ₃	CH

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R ⁵	R ²	R ³	Z	R ⁵	R ²	R ³	Z
CH ₃	C≡CH	Cl	CH	CH ₃	SCH ₂ CH ₃	CH ₃	CH
CH ₃	C≡CH	OCH ₃	CH	CH ₃	SCH ₂ CH ₃	Cl	CH
CH ₃	SCH ₃	CH ₃	CH	CH ₃	SCH ₂ CH ₃	OCH ₃	CH
CH ₃	SCH ₃	Cl	CH	CH ₃	SOCH ₃	CH ₃	CH
CH ₃	SCH ₃	OCH ₃	CH	CH ₃	SOCH ₃	Cl	CH
H	CH ₃	CH ₃	N	CH ₃	SOCH ₃	OCH ₃	CH
H	CH ₃	CH ₂ CH ₃	N	CH ₃	SO ₂ CH ₃	CH ₃	CH
H	CH ₃	OCH ₃	N	CH ₃	SO ₂ CH ₃	Cl	CH
H	F	CH ₃	N	CH ₃	SO ₂ CH ₃	OCH ₃	CH
H	F	CH ₂ CH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	CH ₃	CH
H	F	OCH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	Cl	CH
H	Cl	CH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	OCH ₃	CH
H	Cl	CH ₂ CH ₃	N	CH ₃	OC ₆ H ₅	CH ₃	CH
H	Cl	OCH ₃	N	CH ₃	OC ₆ H ₅	Cl	CH
H	CH ₃	CH ₃	N	CH ₃	OC ₆ H ₅	OCH ₃	CH
H	CH ₃	CH ₂ CH ₃	N	CH ₃	SCH ₂ CH ₃	CH ₃	N
H	CH ₃	OCH ₃	N	CH ₃	SCH ₂ CH ₃	CH ₂ CH ₃	N
H	CH ₂ CH ₃	CH ₃	N	CH ₃	SCH ₂ CH ₃	OCH ₃	N
H	CH ₂ CH ₃	CH ₂ CH ₃	N	CH ₃	SOCH ₃	CH ₃	N
H	CH ₂ CH ₃	OCH ₃	N	CH ₃	SOCH ₃	CH ₂ CH ₃	N
H	OCH ₃	CH ₃	N	CH ₃	SOCH ₃	OCH ₃	N
H	OCH ₃	CH ₂ CH ₃	N	CH ₃	SO ₂ CH ₃	CH ₃	N
H	OCH ₃	OCH ₃	N	CH ₃	SO ₂ CH ₃	CH ₂ CH ₃	N
H	OCH ₂ CH ₃	CH ₃	N	CH ₃	SO ₂ CH ₃	OCH ₃	N
H	OCH ₂ CH ₃	CH ₂ CH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	CH ₃	N
H	OCH ₂ CH ₃	OCH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	CH ₂ CH ₃	N
H	C≡CH	CH ₃	N	CH ₃	SO ₂ CH ₂ CH ₃	OCH ₃	N
H	C≡CH	CH ₂ CH ₃	N	CH ₃	OC ₆ H ₅	CH ₃	N
H	C≡CH	OCH ₃	N	CH ₃	OC ₆ H ₅	CH ₂ CH ₃	N
H	SCH ₃	CH ₃	N	CH ₃	OC ₆ H ₅	OCH ₃	N
H	SCH ₃	CH ₂ CH ₃	N	Na	H	CH ₃	CH
H	SCH ₃	OCH ₃	N	Na	H	Cl	CH

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R ⁵	R ²	R ³	Z	R ⁵	R ²	R ³	Z
Na	H	OCH ₃	CH	Na	Cl	CH ₂ CH ₃	N
Na	F	CH ₃	CH	Na	Cl	OCH ₃	N
Na	F	Cl	CH	Na	CH ₃	CH ₃	N
Na	F	OCH ₃	CH	Na	CH ₃	CH ₂ CH ₃	N
Na	Cl	CH ₃	CH	Na	CH ₃	OCH ₃	N
Na	Cl	Cl	CH	Na	CH ₂ CH ₃	CH ₃	N
Na	Cl	OCH ₃	CH	Na	CH ₂ CH ₃	CH ₂ CH ₃	N
Na	CH ₃	CH ₃	CH	Na	CH ₂ CH ₃	OCH ₃	N
Na	CH ₃	Cl	CH	Na	OCH ₃	CH ₃	N
Na	CH ₃	OCH ₃	CH	Na	OCH ₃	CH ₂ CH ₃	N
Na	CH ₂ CH ₃	CH ₃	CH	Na	OCH ₃	OCH ₃	N
Na	CH ₂ CH ₃	Cl	CH	Na	OCH ₂ CH ₃	CH ₃	N
Na	CH ₂ CH ₃	OCH ₃	CH	Na	OCH ₂ CH ₃	CH ₂ CH ₃	N
Na	OCH ₃	CH ₃	CH	Na	OCH ₂ CH ₃	OCH ₃	N
Na	OCH ₃	Cl	CH	Na	C≡CH	CH ₃	N
Na	OCH ₃	OCH ₃	CH	Na	C≡CH	CH ₂ CH ₃	N
Na	OCH ₂ CH ₃	CH ₃	CH	Na	C≡CH	OCH ₃	N
Na	OCH ₂ CH ₃	Cl	CH	Na	SCH ₃	CH ₃	N
Na	OCH ₂ CH ₃	OCH ₃	CH	Na	SCH ₃	CH ₂ CH ₃	N
Na	C≡CH	CH ₃	CH	Na	SCH ₃	OCH ₃	N
Na	C≡CH	Cl	CH	Na	SCH ₂ CH ₃	CH ₃	CH
Na	C≡CH	OCH ₃	CH	Na	SCH ₂ CH ₃	Cl	CH
Na	SCH ₃	CH ₃	CH	Na	SCH ₂ CH ₃	OCH ₃	CH
Na	SCH ₃	Cl	CH	Na	SOCH ₃	CH ₃	CH
Na	SCH ₃	OCH ₃	CH	Na	SOCH ₃	Cl	CH
Na	H	CH ₃	N	Na	SOCH ₃	OCH ₃	CH
Na	H	CH ₂ CH ₃	N	Na	SO ₂ CH ₃	CH ₃	CH
Na	H	OCH ₃	N	Na	SO ₂ CH ₃	Cl	CH
Na	F	CH ₃	N	Na	SO ₂ CH ₃	OCH ₃	CH
Na	F	CH ₂ CH ₃	N	Na	SO ₂ CH ₂ CH ₃	CH ₃	CH
Na	F	OCH ₃	N	Na	SO ₂ CH ₂ CH ₃	Cl	CH
Na	Cl	CH ₃	N	Na	SO ₂ CH ₂ CH ₃	OCH ₃	CH

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R^5	R^2	R^3	Z	R^5	R^2	R^3	Z
Na	OC ₆ H ₅	CH ₃	CH	H•NH ₂ CHMe ₂	CH ₂ CH ₃	OCH ₃	CH
Na	OC ₆ H ₅	C1	CH	H•NH ₂ CHMe ₂	OCH ₃	CH ₃	CH
Na	OC ₆ H ₅	OCH ₃	CH	H•NH ₂ CHMe ₂	OCH ₃	C1	CH
Na	SCH ₂ CH ₃	CH ₃	N	H•NH ₂ CHMe ₂	OCH ₃	OCH ₃	CH
Na	SCH ₂ CH ₃	CH ₂ CH ₃	N	H•NH ₂ CHMe ₂	OCH ₂ CH ₃	CH ₃	CH
Na	SCH ₂ CH ₃	OCH ₃	N	H•NH ₂ CHMe ₂	OCH ₂ CH ₃	C1	CH
Na	SOCH ₃	CH ₃	N	H•NH ₂ CHMe ₂	OCH ₂ CH ₃	OCH ₃	CH
Na	SOCH ₃	CH ₂ CH ₃	N	H•NH ₂ CHMe ₂	C≡CH	CH ₃	CH
Na	SOCH ₃	OCH ₃	N	H•NH ₂ CHMe ₂	C≡CH	C1	CH
Na	SO ₂ CH ₃	CH ₃	N	H•NH ₂ CHMe ₂	C≡CH	OCH ₃	CH
Na	SO ₂ CH ₃	CH ₂ CH ₃	N	H•NH ₂ CHMe ₂	SCH ₃	CH ₃	CH
Na	SO ₂ CH ₃	OCH ₃	N	H•NH ₂ CHMe ₂	SCH ₃	C1	CH
Na	SO ₂ CH ₂ CH ₃	CH ₃	N	H•NH ₂ CHMe ₂	SCH ₃	OCH ₃	N
Na	SO ₂ CH ₂ CH ₃	CH ₂ CH ₃	N	H•NH ₂ CHMe ₂	H	CH ₃	N
Na	SO ₂ CH ₂ CH ₃	OCH ₃	N	H•NH ₂ CHMe ₂	H	CH ₂ CH ₃	N
Na	OC ₆ H ₅	CH ₃	N	H•NH ₂ CHMe ₂	H	OCH ₃	N
Na	OC ₆ H ₅	CH ₂ CH ₃	N	H•NH ₂ CHMe ₂	F	CH ₃	N
Na	OC ₆ H ₅	OCH ₃	N	H•NH ₂ CHMe ₂	F	CH ₂ CH ₃	N
H•NH ₂ CHMe ₂	H	CH ₃	CH	H•NH ₂ CHMe ₂	F	OCH ₃	N
H•NH ₂ CHMe ₂	H	C1	CH	H•NH ₂ CHMe ₂	C1	CH ₃	N
H•NH ₂ CHMe ₂	H	OCH ₃	CH	H•NH ₂ CHMe ₂	C1	CH ₂ CH ₃	N
H•NH ₂ CHMe ₂	F	CH ₃	CH	H•NH ₂ CHMe ₂	C1	OCH ₃	N
H•NH ₂ CHMe ₂	F	C1	CH	H•NH ₂ CHMe ₂	CH ₃	CH ₃	N
H•NH ₂ CHMe ₂	F	OCH ₃	CH	H•NH ₂ CHMe ₂	CH ₃	CH ₂ CH ₃	N
H•NH ₂ CHMe ₂	C1	CH ₃	CH	H•NH ₂ CHMe ₂	CH ₃	OCH ₃	N
H•NH ₂ CHMe ₂	C1	C1	CH	H•NH ₂ CHMe ₂	CH ₂ CH ₃	CH ₃	N
H•NH ₂ CHMe ₂	C1	OCH ₃	CH	H•NH ₂ CHMe ₂	CH ₂ CH ₃	CH ₂ CH ₃	N
H•NH ₂ CHMe ₂	CH ₃	CH ₃	CH	H•NH ₂ CHMe ₂	CH ₂ CH ₃	OCH ₃	N
H•NH ₂ CHMe ₂	CH ₃	C1	CH	H•NH ₂ CHMe ₂	OCH ₃	CH ₃	N
H•NH ₂ CHMe ₂	CH ₃	OCH ₃	CH	H•NH ₂ CHMe ₂	OCH ₃	CH ₂ CH ₃	N
H•NH ₂ CHMe ₂	CH ₂ CH ₃	CH ₃	CH	H•NH ₂ CHMe ₂	OCH ₃	OCH ₃	N
H•NH ₂ CHMe ₂	CH ₂ CH ₃	C1	CH	H•NH ₂ CHMe ₂	OCH ₂ CH ₃	CH ₃	N

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R ⁵	R ²	R ³	Z	R ⁵	R ²	R ³	Z
H-NH ₂ CHMe ₂	OCH ₂ CH ₃	CH ₂ CH ₃	N	H-NH ₂ CHMe ₂	SO ₂ CH ₃	OCH ₃	N
H-NH ₂ CHMe ₂	OCH ₂ CH ₃	OCH ₃	N	H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	CH ₃	N
H-NH ₂ CHMe ₂	C≡CH	CH ₃	N	H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	CH ₂ CH ₃	N
H-NH ₂ CHMe ₂	C≡CH	CH ₂ CH ₃	N	H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	OCH ₃	N
H-NH ₂ CHMe ₂	C≡CH	OCH ₃	N	H-NH ₂ CHMe ₂	OC ₆ H ₅	CH ₃	N
H-NH ₂ CHMe ₂	SCH ₃	CH ₃	N	H-NH ₂ CHMe ₂	OC ₆ H ₅	CH ₂ CH ₃	N
H-NH ₂ CHMe ₂	SCH ₃	CH ₂ CH ₃	N	H-NH ₂ CHMe ₂	OC ₆ H ₅	OCH ₃	N
H-NH ₂ CHMe ₂	SCH ₃	OCH ₃	N	CH ₂ CF ₃	H	CH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	CH ₃	CH	CH ₂ CF ₃	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	Cl	CH	CH ₂ CF ₃	Cl	OCH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	OCH ₃	CH	CH ₂ CH ₂ Cl	F	CH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	CH ₃	CH	CH ₂ CH ₂ Cl	F	OCH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	Cl	CH	CH ₂ CH ₂ Cl	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	OCH ₃	CH	CH ₂ CH=CH ₂	Cl	CH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₃	CH ₃	CH	CH ₂ CH=CH ₂	Cl	OCH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₃	Cl	CH	CH ₂ CH=CH ₂	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₃	OCH ₃	CH	CH ₂ C≡CH	CH ₃	CH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	CH ₃	CH	CH ₂ C≡CH	CH ₃	OCH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	Cl	CH	CH ₂ C≡CH	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₂ CH ₃	OCH ₃	CH	CH ₂ -4-Cl-C ₆ H ₄	CH ₂ CH ₃	CH ₃	CH
H-NH ₂ CHMe ₂	OC ₆ H ₅	CH ₃	CH	CH ₂ -4-Cl-C ₆ H ₄	CH ₂ CH ₃	OCH ₃	CH
H-NH ₂ CHMe ₂	OC ₆ H ₅	Cl	CH	CH ₂ -4-Cl-C ₆ H ₄	H	OCH ₃	CH
H-NH ₂ CHMe ₂	OC ₆ H ₅	OCH ₃	CH	CH ₂ -2-F-C ₆ H ₄	OCH ₃	CH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	CH ₃	N	CH ₂ -2-F-C ₆ H ₄	OCH ₃	OCH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	CH ₂ CH ₃	N	CH ₂ -2-F-C ₆ H ₄	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SCH ₂ CH ₃	OCH ₃	N	CH ₂ CH ₂ OCH ₃	OCH ₂ CH ₃	CH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	CH ₃	N	CH ₂ CH ₂ OCH ₃	OCH ₂ CH ₃	OCH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	CH ₂ CH ₃	N	CH ₂ CH ₂ OCH ₃	H	OCH ₃	CH
H-NH ₂ CHMe ₂	SOCH ₃	OCH ₃	N	Li	C≡CH	CH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₃	CH ₃	N	Li	C≡CH	OCH ₃	CH
H-NH ₂ CHMe ₂	SO ₂ CH ₃	CH ₂ CH ₃	N	Li	H	OCH ₃	CH

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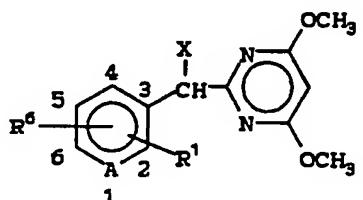
R ⁵	R ²	R ³	Z	R ⁵	R ²	R ³	Z
K	SCH ₃	CH ₃	CH	Cay ₂	SO ₂ CH ₃	CH ₃	CH
K	SCH ₃	OCH ₃	CH	Cay ₂	SO ₂ CH ₃	Cl	CH
K	H	OCH ₃	CH	Cay ₂	H	OCH ₃	CH
CH ₂ CF ₃	H	CH ₃	N	H•NHEt ₂	SCH ₂ CH ₃	CH ₃	CH
CH ₂ CF ₃	H	OCH ₃	N	H•NHEt ₂	SCH ₂ CH ₃	OCH ₃	CH
CH ₂ CF ₃	F	OCH ₃	N	H•NHEt ₂	SCH ₂ CH ₃	OCH ₃	CH
CH ₂ CH ₂ Cl	F	CH ₃	N	Cay ₂	SO ₂ CH ₃	CH ₃	CH
CH ₂ CH ₂ Cl	F	OCH ₃	N	Cay ₂	SO ₂ CH ₃	CH ₂ CH ₃	CH
CH ₂ CH ₂ Cl	H	OCH ₃	N	Cay ₂	SO ₂ CH ₃	OCH ₃	CH
CH ₂ CH=CH ₂	Cl	CH ₃	N				
CH ₂ CH=CH ₂	Cl	OCH ₃	N				
CH ₂ CH=CH ₂	Cl	OCH ₃	N				
CH ₂ C≡CH	CH ₃	CH ₃	N				
CH ₂ C≡CH	CH ₃	OCH ₃	N				
CH ₂ C≡CH	CH ₃	OCH ₃	N				
CH ₂ -4-Cl-C ₆ H ₄	CH ₂ CH ₃	CH ₃	N				
CH ₂ -4-Cl-C ₆ H ₄	CH ₂ CH ₃	OCH ₃	N				
CH ₂ -4-Cl-C ₆ H ₄	CH ₂ CH ₃	OCH ₃	N				
CH ₂ -2-F-C ₆ H ₄	OCH ₃	CH ₃	N				
CH ₂ -2-F-C ₆ H ₄	OCH ₃	OCH ₃	N				
CH ₂ -2-F-C ₆ H ₄	OCH ₃	OCH ₃	N				
CH ₂ CH ₂ OCH ₃	OCH ₂ CH ₃	CH ₃	N				
CH ₂ CH ₂ OCH ₃	OCH ₂ CH ₃	OCH ₃	N				
CH ₂ CH ₂ OCH ₃	OCH ₂ CH ₃	OCH ₃	N				
Li	C≡CH	CH ₃	N				
Li	C≡CH	OCH ₃	N				
Li	C≡CH	OCH ₃	N				
K	SCH ₃	CH ₃	N				
K	SCH ₃	OCH ₃	N				
K	SCH ₃	OCH ₃	N				
H•NHEt ₂	SCH ₂ CH ₃	CH ₃	CH				
H•NHEt ₂	SCH ₂ CH ₃	OCH ₃	CH				
H•NHEt ₂	H	OCH ₃	CH				

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TABLE 3



A	R ⁶	X	R ¹	A	R ⁶	X	R ¹
CH	H	F	2-CO ₂ H	COCH ₃	H	F	2-CO ₂ H
CH	H	F	2-CO ₂ CH ₃	COCH ₃	H	F	2-CO ₂ CH ₃
CH	H	F	2-CO ₂ CH ₂ Ph	COCH ₃	H	F	2-CO ₂ CH ₂ Ph
CH	H	Cl	2-CO ₂ H	COCH ₃	H	Cl	2-CO ₂ H
CH	H	Cl	2-CO ₂ CH ₃	COCH ₃	H	Cl	2-CO ₂ CH ₃
CH	H	Cl	2-CO ₂ CH ₂ Ph	COCH ₃	H	Cl	2-CO ₂ CH ₂ Ph
CH	H	CH ₃	2-CO ₂ H	COCH ₃	H	CH ₃	2-CO ₂ H
CH	H	CH ₃	2-CO ₂ CH ₃	COCH ₃	H	CH ₃	2-CO ₂ CH ₃
CH	H	CH ₃	2-CO ₂ CH ₂ Ph	COCH ₃	H	CH ₃	2-CO ₂ CH ₂ Ph
CCH ₃	H	F	2-CO ₂ H	CCl	H	F	2-CO ₂ H
CCH ₃	H	F	2-CO ₂ CH ₃	CCl	H	F	2-CO ₂ CH ₃
CCH ₃	H	F	2-CO ₂ CH ₂ Ph	CCl	H	F	2-CO ₂ CH ₂ Ph
CCH ₃	H	Cl	2-CO ₂ H	CCl	H	Cl	2-CO ₂ H
CCH ₃	H	Cl	2-CO ₂ CH ₃	CCl	H	Cl	2-CO ₂ CH ₃
CCH ₃	H	Cl	2-CO ₂ CH ₂ Ph	CCl	H	Cl	2-CO ₂ CH ₂ Ph
CCH ₃	H	CH ₃	2-CO ₂ H	CCl	H	CH ₃	2-CO ₂ H
CCH ₃	H	CH ₃	2-CO ₂ CH ₃	CCl	H	CH ₃	2-CO ₂ CH ₃
CCH ₃	H	CH ₃	2-CO ₂ CH ₂ Ph	CCl	H	CH ₃	2-CO ₂ CH ₂ Ph

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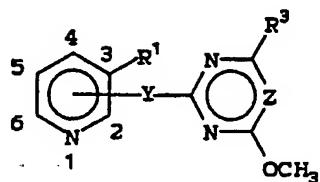
A	R ⁶	X	R ¹	A	R ⁶	X	R ¹
N	H	F	2-CO ₂ H	N	H	F	4-CO ₂ H
N	H	F	2-CO ₂ CH ₃	N	H	F	4-CO ₂ CH ₃
N	H	F	2-CO ₂ CH ₂ Ph	N	H	F	4-CO ₂ CH ₂ Ph
N	H	Cl	2-CO ₂ H	N	H	Cl	4-CO ₂ H
N	H	Cl	2-CO ₂ CH ₃	N	H	Cl	4-CO ₂ CH ₃
N	H	Cl	2-CO ₂ CH ₂ Ph	N	H	Cl	4-CO ₂ CH ₂ Ph
N	H	CH ₃	2-CO ₂ H	N	H	CH ₃	4-CO ₂ H
N	H	CH ₃	2-CO ₂ CH ₃	N	H	CH ₃	4-CO ₂ CH ₃
N	H	CH ₃	2-CO ₂ CH ₂ Ph	N	H	CH ₃	4-CO ₂ CH ₂ Ph
N	4-F	F	2-CO ₂ H	N	2-F	F	4-CO ₂ H
N	4-F	F	2-CO ₂ CH ₃	N	2-F	F	4-CO ₂ CH ₃
N	4-F	F	2-CO ₂ CH ₂ Ph	N	2-F	F	4-CO ₂ CH ₂ Ph
N	5-OCH ₃	CH ₃	2-CO ₂ H	N	5-OCH ₃	CH ₃	4-CO ₂ H
N	5-OCH ₃	CH ₃	2-CO ₂ CH ₃	N	5-OCH ₃	CH ₃	4-CO ₂ CH ₃
N	5-OCH ₃	CH ₃	2-CO ₂ CH ₂ Ph	N	5-OCH ₃	CH ₃	4-CO ₂ CH ₂ Ph
N	6-SCH ₃	Cl	2-CO ₂ H	N	6-SCH ₃	Cl	4-CO ₂ H
N	6-SCH ₃	Cl	2-CO ₂ CH ₃	N	6-SCH ₃	Cl	4-CO ₂ CH ₃
N	6-SCH ₃	Cl	2-CO ₂ CH ₂ Ph	N	6-SCH ₃	Cl	4-CO ₂ CH ₂ Ph
N	H	CN	2-CO ₂ H	N	H	CN	4-CO ₂ H

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TABLE 4



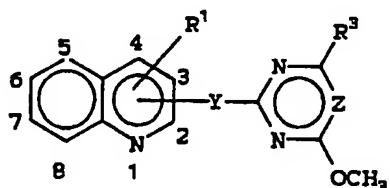
X	R¹	R³	Z	X	R¹	R³	Z
2-CH ₂	CO ₂ H	OCH ₃	CH	4-CH ₂	CO ₂ H	OCH ₃	CH
2-CH ₂	CO ₂ CH ₃	OCH ₃	CH	4-CH ₂	CO ₂ CH ₃	OCH ₃	CH
2-CH ₂	CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	4-CH ₂	CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
2-CH ₂	CO ₂ H	CH ₃	CH	4-CH ₂	CO ₂ H	CH ₃	CH
2-CH ₂	CO ₂ H	CH ₃	N	4-CH ₂	CO ₂ H	CH ₃	N
2-CHCN	CO ₂ H	OCH ₃	CH	4-CHCN	CO ₂ H	OCH ₃	CH
2-CHCN	CO ₂ CH ₃	OCH ₃	CH	4-CHCN	CO ₂ CH ₃	OCH ₃	CH
2-CHCN	CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	4-CHCN	CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
2-CHCN	CO ₂ H	CH ₃	CH	4-CHCN	CO ₂ H	CH ₃	CH
2-CHCN	CO ₂ H	CH ₃	N	4-CHCN	CO ₂ H	CH ₃	N

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TABLE 5



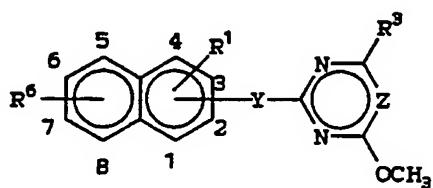
X	R ¹	R ³	Z	X	R ¹	R ³	Z
2-CH ₂	3-CO ₂ H	OCH ₃	CH	3-CH ₂	4-CO ₂ H	OCH ₃	CH
2-CH ₂	3-CO ₂ CH ₃	OCH ₃	CH	3-CH ₂	4-CO ₂ CH ₃	OCH ₃	CH
2-CH ₂	3-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	3-CH ₂	4-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
2-CH ₂	3-CO ₂ H	CH ₃	CH	3-CH ₂	4-CO ₂ H	CH ₃	CH
2-CH ₂	3-CO ₂ H	CH ₃	N	3-CH ₂	4-CO ₂ H	CH ₃	N
2-CHCN	3-CO ₂ H	OCH ₃	CH	3-CHCN	4-CO ₂ H	OCH ₃	CH
2-CHCN	3-CO ₂ CH ₃	OCH ₃	CH	3-CHCN	4-CO ₂ CH ₃	OCH ₃	CH
2-CHCN	3-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	3-CHCN	4-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
2-CHCN	3-CO ₂ H	CH ₃	CH	3-CHCN	4-CO ₂ H	CH ₃	CH
2-CHCN	3-CO ₂ H	CH ₃	N	3-CHCN	4-CO ₂ H	CH ₃	N
6-CH ₂	5-CO ₂ H	OCH ₃	CH	7-CH ₂	8-CO ₂ H	OCH ₃	CH
6-CH ₂	5-CO ₂ CH ₃	OCH ₃	CH	7-CH ₂	8-CO ₂ CH ₃	OCH ₃	CH
6-CH ₂	5-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	7-CH ₂	8-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
6-CH ₂	5-CO ₂ H	CH ₃	CH	7-CH ₂	8-CO ₂ H	CH ₃	CH
6-CH ₂	5-CO ₂ H	CH ₃	N	7-CH ₂	8-CO ₂ H	CH ₃	N
6-CHCN	5-CO ₂ H	OCH ₃	CH	7-CHCN	8-CO ₂ H	OCH ₃	CH
6-CHCN	5-CO ₂ CH ₃	OCH ₃	CH	7-CHCN	8-CO ₂ CH ₃	OCH ₃	CH
6-CHCN	5-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH	7-CHCN	8-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	CH
6-CHCN	5-CO ₂ H	CH ₃	CH	7-CHCN	8-CO ₂ H	CH ₃	CH
6-CHCN	5-CO ₂ H	CH ₃	N	7-CHCN	8-CO ₂ H	CH ₃	N

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TABLE 6

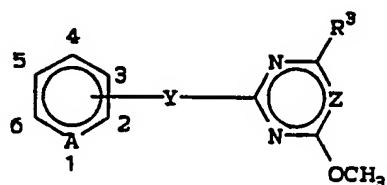


Y	R¹	R³	R⁶	Z
2-CH ₂	1-CHO	OCH ₃	H	CH
2-CH ₂	1-CO ₂ H	OCH ₃	8-Cl	CH
2-CH ₂	1-CO ₂ H	CH ₃	H	CH
2-CH ₂	1-CO ₂ H	OCH ₃	H	CH
2-CH ₂	1-CO ₂ CH ₃	CH ₃	H	N
2-CH ₂	1-CO ₂ CH ₃	OCH ₃	H	CH
2-CH(OH)	1-CHO	OCH ₃	H	CH
2-CH(OH)	1-CO ₂ H	OCH ₃	H	CH
2-CH(OH)	1-CO ₂ H	CH ₃	H	N
2-CH(OH)	1-CO ₂ CH ₃	OCH ₃	H	CH
2-CH(OH)	1-CO ₂ CH ₂ C ₆ H ₅	OCH ₃	H	CH
2-CHCl	1-CHO	OCH ₃	H	CH
2-CHCl	1-CO ₂ H	OCH ₃	H	CH
2-CHCl	1-CO ₂ H	CH ₃	H	CH
2-CHCl	1-CO ₂ CH ₃	OCH ₃	H	N
2-CHCl	1-CO ₂ CH ₃	OCH ₃	H	CN
2-CHCN	1-CHO	OCH ₃	H	CH
2-CHCN	1-CO ₂ H	OCH ₃	H	CH
2-CHCN	1-CO ₂ H	OCH ₃	6-Cl	CH
2-CHCN	1-CO ₂ Na	OCH ₃	H	CH
2-CHCN	1-CO ₂ Na	OCH ₃	H	N

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TABLE 7

A	X	R ³	Z	A	X	R ³	Z
CH	2-CHCO ₂ CH ₃	OCH ₃	CH	N	2-CHCO ₂ CH ₃	OCH ₃	CH
CH	2-CHCO ₂ CH ₂ CH ₃	OCH ₃	CH	N	2-CHCO ₂ CH ₂ CH ₃	OCH ₃	CH
CH	2-CHCO ₂ CH ₂ CH ₃	CH ₃	CH	N	2-CHCO ₂ CH ₂ CH ₃	CH ₃	CH
CH	2-CHCO ₂ CH ₂ CH ₃	CH ₃	N	N	2-CHCO ₂ CH ₂ CH ₃	CH ₃	N
CH	2-CHCO ₂ CH ₂ CH ₃	N(CH ₃) ₂	CH	N	2-CHCO ₂ CH ₂ CH ₃	N(CH ₃) ₂	CH
CH	2-CHCO ₂ CH ₂ CH ₂ CH ₃	OCH ₃	CH	N	2-CHCO ₂ CH ₂ CH ₂ CH ₃	OCH ₃	CH
CH	2-CHCO ₂ CH ₂ C ₆ H ₄	OCH ₃	CH	N	2-CHCO ₂ CH ₂ C ₆ H ₄	OCH ₃	CH
CH	2-CHCO ₂ CH ₂ C ₆ H ₄	CH ₃	N	N	2-CHCO ₂ CH ₂ C ₆ H ₄	CH ₃	N
CH	2-CHCO ₂ CH ₂ CH=CH ₂	CH ₃	CH	N	2-CHCO ₂ CH ₂ CH=CH ₂	CH ₃	CH
CH	2-CHCO ₂ CH ₂ CH=CH ₂	OCH ₃	CH	N	2-CHCO ₂ CH ₂ CH=CH ₂	OCH ₃	CH
CH	2-CHCO ₂ CH ₂ C≡CH	OCH ₃	CH	N	2-CHCO ₂ CH ₂ C≡CH	OCH ₃	CH
C-CH ₃	2-CO ₂ CH ₂ CH ₃	OCH ₃	CH	N-O	2-CO ₂ CH ₂ CH ₃	OCH ₃	CH
C-OCH ₃	3-CO ₂ CH ₂ CH ₃	OCH ₃	CH	N-O	3-CO ₂ CH ₂ CH ₃	OCH ₃	CH
C-C1	3-CO ₂ CH ₂ CH ₃	OCH ₃	CH	N-O	3-CO ₂ CH ₂ CH ₃	OCH ₃	CH
C-F	3-CO ₂ CH ₂ CH ₃	OCH ₃	CH				

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Formulations

Useful formulations of the compounds of Formula I can be prepared in conventional ways. They include dusts, granules, pellets, solutions, suspensions, emulsions, wettable powders, emulsifiable concentrates and the like. Many of these may be applied directly. Sprayable formulations can be extended in suitable media and used at spray volumes of from a few liters to several hundred liters per hectare. High strength compositions are primarily used as intermediates for further formulation. The formulations, broadly, contain about 0.1% to 99% by weight of active ingredient(s) and at least one of (a) about 0.1% to 20% surfactant(s) and (b) about 1% to 99.9% solid or liquid diluent(s). More specifically, they will contain these ingredients in the following approximate proportions:

20

Table 8

		Weight Percent*		
	Active Ingredient	Diluent(s)	Surfactant(s)	
25	Wettable Powders	20-90	0-74	1-10
	Oil Suspensions,	3-50	40-95	0-15
	Emulsions, Solutions, (including Emulsifiable Concentrates)			
30	Aqueous Suspension	10-50	40-84	1-20
	Dusts	1-25	70-99	0-5
	Granules and Pellets	0.1-95	5-99.9	0-15
	High Strength Compositions	90-99	0-10	0-2

35 * Active ingredient plus at least one of a Surfactant or a Diluent equals 100 weight percent.

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Lower or higher levels of active ingredient can, of course, be present depending on the intended use 5 and the physical properties of the compound. Higher ratios of surfactant to active ingredient are sometimes desirable, and are achieved by incorporation into the formulation or by tank mixing.

Typical solid diluents are described in Watkins, 10 et al., "Handbook of Insecticide Dust Diluents and Carriers", 2nd Ed., Dorland Books, Caldwell, New Jersey, but other solids, either mined or manufactured, may be used. The more absorptive diluents are preferred for wettable powders and the denser 15 ones for dusts. Typical liquid diluents and solvents are described in Marsden, "Solvents Guide," 2nd Ed., Interscience, New York, 1950. Solubility under 0.1% is preferred for suspension concentrates; solution concentrates are preferably stable against phase 20 separation at 0°C. "McCutcheon's Detergents and Emulsifiers Annual", MC Publishing Corp., Ridgewood, New Jersey, as well as Sisely and Wood, "Encyclopedia of Surface Active Agents", Chemical Publishing Co., Inc., New York, 1964, list surfactants and recommended 25 uses. All formulations can contain minor amounts of additives to reduce foaming, caking, corrosion, micro-biological growth, etc.

The methods of making such compositions are well known. Solutions are prepared by simply mixing the 30 ingredients. Fine solid compositions are made by blending and, usually, grinding as in a hammer or fluid energy mill. Suspensions are prepared by wet milling (see, for example, Littler, U.S. Patent 3,060,084). Granules and pellets may be made by 35 spraying the active material upon preformed granular carriers or by agglomeration techniques. See J. E.

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Browning, "Agglomeration", Chemical Engineering, December 4, 1967, pp. 147ff. and "Perry's Chemical Engineer's Handbook", 5th Ed., McGraw-Hill, New York, 1973, pp. 8-57ff.

For further information regarding the art of formulation, see for example:

H. M. Loux, U.S. Patent 3,235,361, February 15, 1966, Col. 6, line 16 through Col. 7, line 19 and Examples 10 through 41;

R. W. Luckenbaugh, U.S. Patent 3,309,192, March 14, 1967, Col. 5, line 43 through Col. 7, line 62 and Examples 8, 12, 15, 39, 41, 52, 53, 58, 132, 138-140, 162-164, 166, 167 and 169-182;

H. Gysin and E. Knusli, U.S. Patent 2,891,855, June 23, 1959, Col. 3, line 66 through Col. 5, line 17 and Examples 1-4;

G. C. Klingman, "Weed Control as a Science", John Wiley and Sons, Inc., New York, 1961, pp. 81-96; and

J. D. Fryer and S. A. Evans, "Weed Control Handbook", 5th Ed., Blackwell Scientific Publications, Oxford, 1968, pp. 101-103.

In the following examples, all parts are by weight unless otherwise indicated.

Example A

Wettable Powder

30	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid	80%
	sodium alkyl naphthalenesulfonate	2%
	sodium ligninsulfonate	2%
	synthetic amorphous silica	3%
35	kaolinite	13%

The ingredients are blended, hammer-milled until all the solids are essentially under 50 microns, reblended, and packaged.

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Example BWettable Powder

5	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid	50%
	sodium alkyl naphthalenesulfonate	2%
	low viscosity methyl cellulose	2%
	diatomaceous earth	46%
10	The ingredients are blended, coarsely hammer-milled and then air-milled to produce particles essentially all below 10 microns in diameter. The product is reblended before packaging.	

15

Example CGranule

Wettable Powder of Example B	5%
attapulgite granules	95%
(U.S.S. 20-40 mesh; 0.84-0.42 mm)	

20

A slurry of wettable powder containing 25% solids is sprayed on the surface of attapulgite granules in a double-cone blender. The granules are dried and packaged.

25

Example DExtruded Pellet

2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid

anhydrous sodium sulfate	10%
crude calcium ligninsulfonate	5%
sodium alkyl naphthalenesulfonate	1%
calcium/magnesium bentonite	59%
The ingredients are blended, hammer-milled and then moistened with about 12% water. The mixture is extruded as cylinders about 3 mm diameter which are cut to produce pellets about 3 mm long. These may be	

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used directly after drying, or the dried pellets may
be crushed to pass a U.S.S. No. 20 sieve (0.84 mm
5 openings). The granules held on a U.S.S. No. 40 sieve
(0.42 mm openings) may be packaged for use and the
fines recycled.

Example E10 Oil Suspension

2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
methyl-benzoic acid	25%
polyoxyethylene sorbitol hexaoleate	5%
highly aliphatic hydrocarbon oil	70%

15 The ingredients are ground together in a sand mill until the solid particles have been reduced to under about 5 microns. The resulting thick suspension may be applied directly, but preferably after being extended with oils or emulsified in water.

20

Example FWettable Powder

2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
methyl-benzoic acid	20%
25 sodium alkynaphthalenesulfonate	4%
sodium ligninsulfonate	4%
low viscosity methyl cellulose	3%
attapulgite	69%

30 The ingredients are thoroughly blended. After grinding in a hammer-mill to produce particles essentially all below 100 microns, the material is reblended and sifted through a U.S.S. No. 50 sieve (0.3 mm opening) and packaged.

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Example G

Low Strength Granule

Aqueous Suspension

2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
methyl-benzoic acid	40%
polyacrylic acid thickener	0.3%
dodecylphenol polyethylene glycol ether	0.5%
disodium phosphate.	1%
monosodium phosphate	0.5%
polyvinyl alcohol	1.0%
water	56.7%

The ingredients are blended and ground together in a sand mill to produce particles essentially all under 5 microns in size.

30

Example 1

Solution

2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methylbenzoic acid
water 5% 25%

35 The salt is added directly to the water with
stirring to produce the solution, which may then be
packaged for use.

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Example JLow Strength Granule

5	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
	methyl-benzoic acid	0.1%
	attapulgite granules (U.S.S. 20-40 mesh)	99.9%

10 The active ingredient is dissolved in a solvent and the solution is sprayed upon dedusted granules in a double-cone blender. After spraying of the solution has been completed, the material is warmed to evaporate the solvent. The material is allowed to cool and then packaged.

15

Example KGranule

20	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
	methyl-benzoic acid	80%
	wetting agent	1%
	crude ligninsulfonate salt (containing 5-20% of the natural sugars)	10%
	attapulgite clay	9%

25 The ingredients are blended and milled to pass through a 100 mesh screen. This material is then added to a fluid bed granulator, the air flow is adjusted to gently fluidize the material, and a fine spray of water is sprayed onto the fluidized material. The fluidization and spraying are continued until granules of the desired size range are made. The spraying is stopped, but fluidization is continued, optionally with heat, until the water content is reduced to the desired level, generally less than 1%. The material is then discharged, screened to the desired size range, generally 14-100 mesh (1410-149 microns), and packaged for use.

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Example LHigh Strength Concentrate

5	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
	methyl-benzoic acid	99%
	silica aerogel	0.5%
	synthetic amorphous silica	0.5%
The ingredients are blended and ground in a		
10	hammer-mill to produce a material essentially all	
	passing a U.S.S. No. 50 screen (0.3 mm opening). The	
	concentrate may be formulated further if necessary.	

Example MWettable Powder

15	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
	methyl-benzoic acid	90%
	dioctyl sodium sulfosuccinate	0.1%
	synthetic fine silica	9.9%
The ingredients are blended and ground in a		
20	hammer-mill to produce particles essentially all below	
	100 microns. The material is sifted through a U.S.S.	
	No. 50 screen and then packaged.	

25

Example NWettable Powder

25	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-	
	methyl-benzoic acid	40%
	sodium ligninsulfonate	20%
30	montmorillonite clay	40%
The ingredients are thoroughly blended, coarsely		
	hammer-milled and then air-milled to produce particles	
	essentially all below 10 microns in size. The material	
	is reblended and then packaged.	

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Example OOil Suspension

5	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid	35%
	blend of polyalcohol carboxylic esters and oil soluble petroleum sulfonates	6%
10	xylene	59%
	The ingredients are combined and ground together in a sand mill to produce particles essentially all below 5 microns. The product can be used directly, extended with oils, or emulsified in water.	
15		

Example PDust

20	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid	10%
	attapulgite	10%
	Pyrophyllite	80%
	The active ingredient is blended with attapulgite and then passed through a hammer-mill to produce particles substantially all below 200 microns. The	
25	ground concentrate is then blended with powdered pyrophyllite until homogeneous.	

Example QEmulsifiable Concentrate

30	2-[4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-benzoic acid	10%
	chlorobenzene	84%
	sorbitan monostearate and polyoxyethylene condensates thereof	6%
35	The ingredients are combined and stirred to produce a solution which can be emulsified in water for application.	

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Utility

Test results indicate that compounds of this invention are active postemergence and preemergence herbicides. These compounds are useful for the control of selected grass and broadleaf weeds with tolerance to important agronomic crops which include, but are not limited to barley (*Hordeum vulgare*), corn (*Zea mays*), cotton (*Gossypium hirsutum*), and wheat (*Triticum aestivum*). Weed species controlled include, but are not limited to cocklebur (*Xanthium pensylvanicum*), teaweed (*Sida spinosa*), and velvetleaf (*Abutilon theophrasti*).

These compounds also have utility for complete control and/or selected control of vegetation in specified areas such as around storage tanks, parking lots, highways, and railways, and in fallow crop, citrus, and plantation crop areas. Alternatively, these compounds are useful to modify plant growth.

A herbicidally effective amount of the compounds of this invention is determined by a number of factors. These factors include: formulation selected, method of application, amount and type of vegetation present, growing conditions, etc. In general terms, a herbicidally effective amount of the compounds of the invention is applied at rates from 0.004 to 20 kg/ha with a preferred rate range of 0.025 to 2 kg/ha. One skilled in the art can easily determine the application rate needed for the desired level of weed control.

Compounds of this invention may be used alone or in combination with other commercial herbicides, insecticides, or fungicides. The following list exemplifies some of the herbicides suitable for use in mixtures. A combination of a compound from this invention with one or more of the following herbicides may be particularly useful for weed control.

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	<u>Common Name</u>	<u>Chemical Name</u>
5	acetochlor	2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide
	acifluorfen	5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoic acid
	acrolein	2-propenal
10	alachlor	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide
	anilofos	S-4-chloro-N-isopropylcarbaniloyl-methyl-O,O-dimethyl phosphorodithioate
15	ametryn	N-ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
	amitrole	1H-1,2,4-triazol-3-amine
	AMS	ammonium sulfamate
20	asulam	methyl [(4-aminophenyl)sulfonyl]-carbamate
	atrazine	6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
	barban	4-chloro-2-butynyl 3-chlorocarbamate
25	benefin	N-butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl)benzenamine
	bensulfuron methyl	2-[[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]methylcarbonyl]-amino]sulfonyl]methyl]benzoic acid, methyl ester
30	bensulide	O,O-bis(1-methylethyl) S-[2-[(phenylsulfonyl)amino]-ethyl]phosphorodithioate
	bentazon	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one, 2,2-dioxide
35	benzofluor	N-[4-(ethylthio)-2-(trifluoromethyl)phenyl]methanesulfonamide

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	<u>Common Name</u>	<u>Chemical Name</u>
5	benzoylprop	N-benzoyl-N-(3,4-dichlorophenyl)-DL-alanine
	bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
	bromacil	5-bromo-6-methyl-3-(1-methylpropyl)-2,4(1H,3H)pyrimidinedione
10	bromoxynil	3,5-dibromo-4-hydroxybenzonitrile
	butachlor	N-(butoxymethyl)-2-chloro-N-(2,6-diethylphenyl)acetamide
	buthiadazole	3-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone
15	butralin	4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine
	butylate	S-ethyl bis(2-methylpropyl)-carbamothioate
20	cacodylic acid	dimethyl arsinic oxide
	CDAA	2-chloro-N,N-di-2-propenylacetamide
	CDEC	2-chloroallyl diethyldithiocarbamate
25	CGA 142,464	3-(4,6-dimethoxy-1,3,5-triazin-2-yl)-1-[2-(2-methoxyethoxy)-phenylsulfonyl]-urea
	chloramben	3-amino-2,5-dichlorobenzoic acid
	chlorbromuron	3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea
30	chlorimuron ethyl	2-[[[[[(4-chloro-6-methoxy-2-pyrimidinyl)ethylamino]carbonyl]amino]sulfonyl]benzoic acid, ethyl ester
	chlormethoxy-nil	2,4-dichlorophenyl 4-nitro-3-methoxyphenyl ether
	chlornitrofen	2,4,6-trichlorophenyl-4-nitro-phenyl ether

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	<u>Common Name</u>	<u>Chemical Name</u>
5	chloroxuron	N'-(4-(4-chlorophenoxy)phenyl)-N,N-dimethylurea
	chlorpropham	1-methylethyl 3-chlorophenylcarbamate
	chlorsulfuron	2-chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzene-sulfonamide
10	chlortoluron	N'-(3-chloro-4-methylphenyl)-N,N-dimethylurea
	cimethylin	exo-1-methyl-4-(1-methylethyl)-2-[(2-methylphenyl)methoxy]-7-oxabicyclo[2.2.1]heptane
15	clethodim	(E,E)-(±)-2-[1-[(3-chloro-2-propenyl)-oxy]imino]propyl]-5-[2-(ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one
	clomazone	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone
20	cloproxydim	(E,E)-2-[1-[(3-chloro-2-propenyl)oxy)-imino]butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
	clopyralid	3,6-dichloro-2-pyridinecarboxylic acid
	CMA	calcium salt of MAA
25	cyanazine	2-[[4-chloro-6-(ethylamino)-1,3,5-triazin-2-yl]amino]-2-methylpropanenitrile
	cycloate	S-ethyl cyclohexylethylcarbamothioate
	cycluron	3-cyclooctyl-1,1-dimethylurea
30	cyperquat	1-methyl-4-phenylpyridinium
	cyprazine	2-chloro-4-(cyclopropylamino)-6-(isopropylamino)-5-triazine
	cyprazole	N-[5-(2-chloro-1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]cyclopropanecarboxamide
35	cypromid	3',4'-dichlorocyclopropanecarboxanilide

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	<u>Common Name</u>	<u>Chemical Name</u>
5	dalapon	2,2-dichloropropanoic acid
	dazomet	tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione
	DCPA	dimethyl 2,3,5,6-tetrachloro-1,4-benzene-dicarboxylate
10	desmediphan	ethyl [3-[[{(phenylamino)carbonyl}oxy]-phenyl]carbamate
	desmetryn	2-(isopropylamino)-4-(methylamino)-6-(methylthio)-2-triazine
	diallate	S-(2,3-dichloro-2-propenyl)bis(1-methylethyl)carbamothioate
15	dicamba	3,6-dichloro-2-methoxybenzoic acid
	dichlobenil	2,6-dichlorobenzonitrile
	dichlorprop	(±)-2-(2,4-dichlorophenoxy)propanoic acid
20	diclofop-methyl	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy]propanoic acid, methyl ester
	diethatyl	N-(chloroacetyl)-N-(2,6-diethylphenyl)-glycine
25	difenoquat	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
	dimepiperate	S-1-methyl-1-phenylethylpiperidine-1-carbothioate
	dinitramine	N ³ ,N ³ -diethyl-2,4-dinitro-6-(trifluoromethyl)-1,3-benzenediamine
30	dinoseb	2-(1-methylpropyl)-4,6-dinitrophenol
	diphenamid	N,N-dimethyl-α-phenylbenzeneacetamide
	dipropetryn	6-(ethylthio)-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
35	diquat	6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinedium ion
	diuron	N'-(3,4-dichlorophenyl)-N,N-dimethylurea

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	<u>Common Name</u>	<u>Chemical Name</u>
5	DNOC	2-methyl-4,6-dinitrophenol
	DSMA	disodium salt of MAA
	dymron	N-(4-methylphenyl)-N'-(1-methyl-1-phenylethyl)urea
10	endothall	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
	EPTC	S-ethyl dipropylcarbamothioate
	esprocarb (SC2957)	S-benzyl-N-ethyl-N-(1,2-dimethyl)-propyl)thiolcarbamate
15	ethalfluralin	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)-benzenamine
	ethofumesate	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
	fenac	2,3,6-trichlorobenzeneacetic acid
20	fenoxaprop	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]-phenoxy]propanoic acid
	fenuron	N,N-dimethyl-N'-phenylurea
	fenuron TCA	Salt of fenuron and TCA
25	flamprop	N-benzoyl-N-(3-chloro-4-fluorophenyl)-DL-alanine
	fluazifop	(±)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
30	fluazifop-P	(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
	fluchloralin	N-(2-chloroethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine
	fluometuron	N,N-dimethyl-N'-(3-(trifluoromethyl)-phenyl)urea

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	<u>Common Name</u>	<u>Chemical Name</u>
5	fluorochloridone	3-chloro-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone
	fluorodifen	p-nitrophenyl α,α,α -trifluoro-2-nitro-p-tolyl ether
10	fluoroglycofen	carboxymethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate
	fluridone	1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone
	fomesafen	5-[2-chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide
15	fosamine	ethyl hydrogen (aminocarbonyl)-phosphate
	glyphosate	N-(phosphonomethyl)glycine
	haloxyfop	2-[4-[[3-chloro-5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
20	hexaflurate	potassium hexafluoroarsenate
	hexazinone	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione
	imazamethabenz	6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluic acid, methyl ester and 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluic acid, methyl ester
25	imazapyr	(\pm)-2-[4,5-dihydro-4-methyl-4-(1-methyl-ethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid
30	imazaquin	2-[4,5-dihydro-4-methyl-4-(1-methyl-ethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid
	imazethapyr	(\pm)-2-[4,5-dihydro-4-methyl-4-(1-methyl-ethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid

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	<u>Common Name</u>	<u>Chemical Name</u>
	ioxynil	4-hydroxy-3,5-diiodobenzonitrile
5	isopropalin	4-(1-methylethyl)-2,6-dinitro-N,N-dipropylbenzenamine
	isoproturon	N-(4-isopropylphenyl)-N',N'-dimethylurea
10	isouron	N'-(5-(1,1-dimethylethyl)-3-isoxazolyl)-N,N-dimethylurea
	isoxaben	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide
	karbutilate	3-[(dimethylamino)carbonyl]amino-phenyl-(1,1-dimethylethyl)carbamate
15	lactofen	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate
	lenacil	3-cyclohexyl-6,7-dihydro-1H-cyclopenta-pyrimidine-2,4(3H,5H)-dione
20	linuron	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea
	MAA	methylarsonic acid
	MAMA	monoammonium salt of MAA
25	MCPA	(4-chloro-2-methylphenoxy)acetic acid
	MCPB	4-(4-chloro-2-methylphenoxy)butanoic acid
	MON 7200	S,S-dimethyl-2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridinedicarbothionate
30	mecoprop	(±)-2-(4-chloro-2-methylphenoxy)-propanoic acid
	mefenacet	2-(2-benzothiazolyloxy-N-methyl-N-phenylacetamide
35	mefluidide	N-[2,4-dimethyl-5-[(trifluoromethyl)sulfonyl]amino]phenyl]acetamide
	methal-propalin	N-(2-methyl-2-propenyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamide

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	<u>Common Name</u>	<u>Chemical Name</u>
5	methabenz-thiazuron	1,3-dimethyl-3-(2-benzothiazolyl)urea
	metham	methylcarbamodithioic acid
10	methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione
10	methoxuron	N'-(3-chloro-4-methoxyphenyl)-N,N-dimethylurea
	metolachlor	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide
15	metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
15	metsulfuron methyl	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]-amino]sulfonyl]benzoic acid, methyl ester
	MH	1,2-dihydro-3,6-pyridazinedione
20	molinate	S-ethyl hexahydro-1H-azepine-1-carbothioate
	monolinuron	3-(p-chlorophenyl)-1-methoxy-1-methylurea
25	monuron	N'-(4-chlorophenyl)-N,N-dimethylurea
	monuron TCA	Salt of monuron and TCA
	MSMA	monosodium salt of MAA
	napropamide	N,N-diethyl-2-(1-naphthalenylxy)-propanamide
30	naptalam	2-[(1-naphthalenylamino)carbonyl]-benzoic acid
	neburon	1-butyl-3-(3,4-dichlorophenyl)-1-methylurea
35	nitralin	4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline
	nitrofen	2,4-dichloro-1-(4-nitrophenoxy)benzene

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	<u>Common Name</u>	<u>Chemical Name</u>
5	nitrofluorfen	2-chloro-1-(4-nitrophenoxy)-4-(trifluoromethyl)benzene
	norea	N,N-dimethyl-N'-(octahydro-4,7-methano-1H-inden-5-yl)urea 3α,-4α,5α,7α,7α-isomer
10	norflurazon	4-chloro-5-(methylamino)-2-[3-(trifluoromethyl)phenyl]-3(2H)-pyridazinone
	oryzalin	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide
15	oxadiazon	3-[2,4-dichloro-5-(1-methylethoxy)-phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-one
	oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene
	paraquat	1,1'-dimethyl-4,4'-dipyridinium ion
20	pebulate	S-propyl butylethylcarbamothioate
	pendimethalin	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine
	perfluidone	1,1,1-trifluoro-N-[2-methyl-4-(phenylsulfonyl)phenyl]methanesulfonamide
25	phenmedipham	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate
	picloram	4-amino-3,5,6-trichloro-2-pyridine-carboxylic acid
30	PPG-1013	5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitroacetophenone oxime-O-acetic acid, methyl ester
	pretilachlor	α-chloro-2,6-diethyl-N-(2-propoxyethyl)acetanilide
35	procyzazine	2-[[4-chloro-6-(cyclopropylamino)-1,3,5-triazine-2-yl]amino]-2-methylpropanenitrile
	profluralin	N-(cyclopropylmethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine

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	<u>Common Name</u>	<u>Chemical Name</u>
5	prometon	6-methoxy-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
	prometryn	N,N'-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
	pronamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide
10	propachlor	2-chloro-N-(1-methylethyl)-N-phenylacetamide
	propanil	N-(3,4-dichlorophenyl)propanamide
	propazine	6-chloro-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
15	propham	1-methylethyl phenylcarbamate
	prosulfalin	N-[(4-(dipropylamino)-3,5-dinitrophenyl)sulfonyl]-S,S-dimethylsulfilimine
20	prynachlor	2-chloro-N-(1-methyl-2-propynyl)acetanilide
	pyrazolate	4-(2,4-dichlorobenzoyl)-1,3-dimethyl-pyrazol-5-yl-p-toluenesulphonate
	pyrazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
25	pyrazosulfuron ethyl	ethyl S-[3-(4,6-dimethoxypyrimidin-2-yl)ureadosulfonyl]-1-methylpyrazole-4-carboxylate
	quinclorac	3,7-dichloro-8-quinoline carboxylic acid
30	quizalofop ethyl	(±)-2-[4-[(6-chloro-2-quinoxalinyl)-oxy]phenoxy]propanoic acid, ethyl ester
	secbumeton	N-ethyl-6-methoxy-N'-(1-methylpropyl)-1,3,5-triazine-2,4-diamine
35	sethoxydim	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
	siduron	N-(2-methylcyclohexyl)-N'-phenylurea

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	<u>Common Name</u>	<u>Chemical Name</u>
5	simazine	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine
	SK-233	1-(α,α -dimethylbenzyl)-3-(4-methyl-phenyl)urea
10	sulfometuron methyl	2-[[[[(4,6-dimethyl-2-pyrimidinyl)-amino]carbonyl]amino]sulfonyl]-benzoic acid, methyl ester
	TCA	trichloroacetic acid
	tebuthiuron	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
15	terbacil	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H)-pyrimidinedione
	terbuchlor	N-(butoxymethyl)-2-chloro-N-[2-(1,1-dimethylethyl)-6-methylphenyl]-acetamide
20	terbutylazine	2-(<u>tert</u> -butylamino)-4-chloro-6-(ethylamino)-S-triazine
	terbutol	2,6-di- <u>tert</u> -butyl-p-tolyl methylcarbamate
	terbutryn	N-(1,1-dimethylethyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
25	thifensulfuron methyl	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid, methyl ester
	thiobencarb	S-[(4-chlorophenyl)methyl] diethylcarbamothioate
30	triallate	S-(2,3,3-trichloro-2-propenyl) bis(1-methylethyl)carbamothioate
	tribenuron methyl	2-[[[[N-(4-methoxy-6-methyl-1,3,5-triazine-2-yl)-N-methylamino]carbonyl]amino]sulfonyl]benzoic acid, methyl ester
35		

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	<u>Common Name</u>	<u>Chemical Name</u>
5	triclopyr	[(3,5,6-trichloro-2-pyridinyl)-oxy]acetic acid
	tridiphane	2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxirane
	trifluralin	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine
10	trimeturon	1-(p-chlorophenyl)-2,3,3-trimethylpseudourrea
	2,4-D	(2,4-dichlorophenoxy)acetic acid
	2,4-DB	4-(2,4-dichlorophenoxy)butanoic acid
15	vernolate	S-propyl dipropylcarbamothioate
	xylachlor	2-chloro-N-(2,3-dimethylphenyl)-N-(1-methylethyl)acetamide
20	Herbicidal properties of the compounds that follow were determined in greenhouse tests. Test results and procedures follow.	

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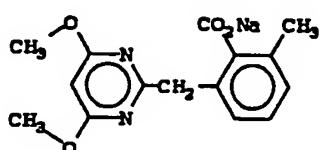
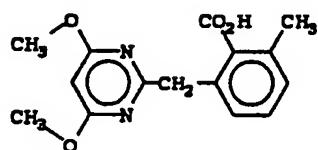
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TABLE OF COMPOUNDS

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Compound 1

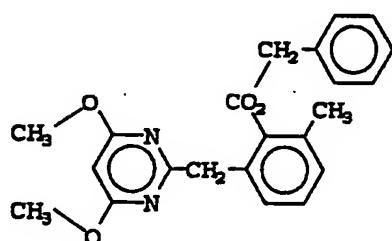
m.p. 122-124°C

Compound 2

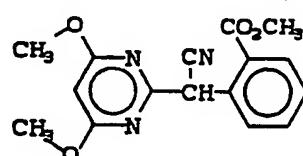
m.p. 180-190°C

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Compound 3

Oil

Compound 4

m.p. 79-81°C

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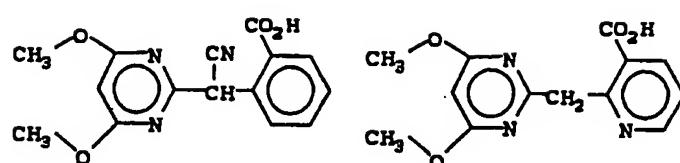
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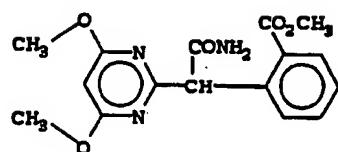


Compound 5
m.p. 214-216°C

Compound 6
m.p. 182-186°C

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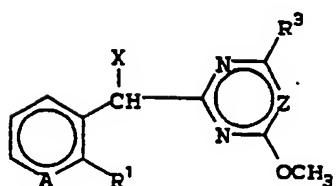


Compound 9
m.p. 120-122°C

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	<u>Cmpd.</u>	<u>X</u>	<u>A</u>	<u>R¹</u>	<u>R³</u>	<u>Z</u>	<u>m.p. (°C)</u>
5	10	CN	CR ² (R ² =H)	CO ₂ CH ₃	OCH ₃	N	Oil
	11	CN	CR ² (R ² =H)	CO ₂ Et	OCH ₃	CH	49-50
	16	CN	CR ² (R ² =NO ₂)	CO ₂ CH ₃	OCH ₃	CH	126-128
	17	CO ₂ Et	CR ² (R ² =H)	CH ₃	OCH ₃	CH	Oil
	18	CO ₂ H	CR ² (R ² =H)	CH ₃	OCH ₃	CH	81-84
	19	CO ₂ Et	CR ² (R ² =H)	H	OCH ₃	CH	Oil
	20	CO ₂ Et	CR ² (R ² =CH ₃)	H	OCH ₃	CH	Oil
10	21	CO ₂ Et	CR ² (R ² =F)	H	OCH ₃	CH	Oil
	22	CO ₂ Et	CR ² (R ² =H)	H	CH ₃	N	Oil

15

SPECTRAL DATA

	<u>Compound</u>	<u>Data</u>
	3	PMR(CDCl ₃ , 90MHz) δ 2.35(s, CH ₃ , 3H), 3.9(s, OCH ₃ , 6H), 4.25(s, CH ₂ , 2H), 5.35(s, OCH ₂ , 2H), 5.85(s, pyrmH, 1H), 7.1-7.6(m, ArH, OH).
20	10	PMR(CDCl ₃ , 200MHz) δ 3.90(s, CO ₂ CH ₃ , 3H), 4.00(s, OCH ₃ , 6H), 6.99(s, CHCN, 1H), 7.4-8.1(m, ArH, 4H).
25	17	PMR(CDCl ₃ , 200MHz) δ 1.35(t, CH ₃ , 3H), 2.54(s, CH ₃ , 3H), 3.96(s, OCH ₃ , 6H), 4.2-4.4(M, CH ₂ O, 2H), 5.49(s, CH, 1H), 6.01(s, pyrmH, 1H), 7.2-7.6(m, ArH, 4H).
30	19	PMR(CDCl ₃ , 200MHz) δ 1.24(t, CH ₃ , 3H), 3.89(s, OCH ₃ , 6H), 5.08(s, CH, 1H), 5.89(s, pyrmH, 1H), 7.2-7.6(m, ArH, 5H).
	20	PMR(CDCl ₃ , 200MHz) δ 1.24(t, CH ₃ , 3H), 2.33(s, CH ₃ , 3H), 3.89(s, OCH ₃ , 6H), 4.1(m, OCH ₂ , 2H), 5.05(s, CH ₂ , 1H), 5.89(s, pyrmH, 1H), 7.1-7.4(m, ArH, 4H).
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<u>Compound</u>	<u>Data</u>
5 21	IR (neat) ν co 1740cm ⁻¹
22	PMR(CDCl ₃ , 200MHz) δ 1.23(t, CH ₃ , 3H), 2.55(s, CH ₃ , 3H), 4.0(s, OCH ₃ , 3H), 4.2(q, OCH ₂ , 2H), 5.07(s, CH, 1H), 7.2-7.6(m, ArH, 5H).

10

TEST A

Seeds of barley (Hordeum vulgare), barnyardgrass (Echinochloa crus-galli), cheatgrass (Bromus secalinus), cocklebur (Xanthium pensylvanicum), corn (Zea mays), cotton (Gossypium hirsutum), crabgrass (Digitaria spp.), bedstraw (Galium aparine), giant foxtail (Setaria faberii), morningglory (Ipomoea hederacea), rice (Oryza sativa), sorghum (Sorghum bicolor), soybean (Glycine max), sugar beet (Beta vulgaris), velvetleaf (Abutilon theophrasti), wheat (Triticum aestivum), wild oat (Avena fatua) and purple nutsedge (Cyperus rotundus) tubers were planted and treated preemergence with test chemicals dissolved in a non-phytotoxic solvent. At the same time, these crop and weed species were also treated with postemergence applications of test chemicals. Plants ranged in height from two to eighteen cm (one to four leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for twelve to sixteen days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table A, are based on a scale of 0 to 10 where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

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Table A

	5	COMPOUND		COMPOUND	
		Rate (2000 g/ha)	1 6	Rate (2000 g/ha)	1 6
POSTEMERGENCE					
	Barley	9	9	Barley	9
10	Barnyardgrass	9	9	Barnyardgrass	9
	Cheatgrass	9	9	Cheatgrass	8
	Cocklebur	9	-	Cocklebur	9
	Corn	9	9	Corn	9
	Cotton	10	9	Cotton	8
15	Crabgrass	8	7	Crabgrass	8
	Giant foxtail	9	9	Giant foxtail	9
	Morningglory	9	10	Morningglory	9
	Nutsedge	10	10	Nutsedge	10
	Rice	9	9	Rice	10
20	Sorghum	9	9	Sorghum	9
	Soybean	9	9	Soybean	9
	Sugar beet	9	10	Sugar beet	9
	Velvetleaf	9	10	Velvetleaf	9
	Wheat	9	8	Wheat	9
25	Wild Oat	9	9	Wild Oat	8

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Table A

	COMPOUND	COMPOUND
5	Rate (1000 g/ha)	6
	POSTEMERGENCE	PREEMERGENCE
	Barley	9
10	Barnyardgrass	8
	Cheatgrass	9
	Cocklebur	10
	Corn	9
	Cotton	9
15	Crabgrass	5
	Giant foxtail	8
	Morningglory	10
	Nutsedge	-
	Rice	9
20	Sorghum	9
	Soybean	9
	Sugar beet	9
	Velvetleaf	10
	Wheat	8
25	Wild Oat	9

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Table A

	COMPOUND 5		COMPOUND
	Rate (100 g/ha) 6		Rate (100 g/ha) 6
	POSTEMERGENCE		PREEMERGENCE
	Barley 8		Barley 3
	Barnyardgrass 4		Barnyardgrass 8
10	Cheatgrass 8		Cheatgrass 7
	Cocklebur 9		Cocklebur 3
	Corn 7		Corn 0
	Cotton 9		Cotton 8
	Crabgrass 4		Crabgrass 5
15	Giant foxtail 5		Giant foxtail 5
	Morningglory 9		Morningglory 7
	Nutsedge 9		Nutsedge 0
	Rice 9		Rice 7
	Sorghum 9		Sorghum 9
20	Soybean 9		Soybean 9
	Sugar beet 9		Sugar beet 7
	Velvetleaf 9		Velvetleaf 9
	Wheat 2		Wheat 2
25	Wild Oat 7		Wild Oat 2

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Table A

	5	Rate (400 g/ha)	COMPOUND			Rate (400 g/ha)	COMPOUND		
			1	2	3		1	2	3
POSTEMERGENCE									
		Barley	9	9	8	Barley	8	8	0
10	Barnyardgrass	9	9	2	Barnyardgrass	9	9	0	
	Cheatgrass	9	9	8	Cheatgrass	8	9	0	
	Cocklebur	9	9	2	Cocklebur	9	8	0	
	Corn	9	9	9	Corn	9	9	2	
15	Cotton	9	3	0	Cotton	8	0	0	
	Crabgrass	7	5	0	Crabgrass	7	6	0	
	Giant foxtail	9	9	7	Giant foxtail	9	9	2	
	Morningglory	4	2	5	Morningglory	8	4	0	
	Nutsedge	10	9	9	Nutsedge	10	10	0	
20	Rice	9	9	9	Rice	10	10	6	
	Sorghum	9	9	8	Sorghum	9	9	3	
	Soybean	9	9	9	Soybean	9	9	3	
	Sugar beet	9	10	10	Sugar beet	9	9	8	
	Velvetleaf	9	9	7	Velvetleaf	9	9	0	
25	Wheat	9	8	2	Wheat	8	8	0	
	Wild Oat	9	8	6	Wild Oat	7	8	0	

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Table A

	5	COMPOUND			COMPOUND		
		Rate (50 g/ha)	2	3	Rate (50 g/ha)	2	3
POSTEMERGENCE							
		Barley	7	3	Barley	6	0
10	Barnyardgrass	1	0	Barnyardgrass	6	0	
	Cheatgrass	9	4	Cheatgrass	7	0	
	Cocklebur	7	1	Cocklebur	3	0	
	Corn	9	6	Corn	9	0	
	Cotton	0	0	Cotton	0	0	
15	Crabgrass	2	0	Crabgrass	2	0	
	Giant foxtail	7	0	Giant foxtail	8	0	
	Morningglory	2	2	Morningglory	4	0	
	Nutsedge	5	0	Nutsedge	10	0	
	Rice	9	3	Rice	9	2	
20	Sorghum	9	3	Sorghum	9	0	
	Soybean	9	7	Soybean	6	0	
	Sugar beet	9	9	Sugar beet	9	3	
	Velvetleaf	9	4	Velvetleaf	7	0	
	Wheat	3	0	Wheat	3	0	
25	Wild Oat	0	0	Wild Oat	5	0	

30

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TEST B

Seeds of barley (*Hordeum vulgare*),
5 barnyardgrass (*Echinochloa crus-galli*), bedstraw
(*Galium aparine*), blackgrass (*Alopecurus*
myosuroides), cheatgrass (*Bromus secalinus*),
chickweed (*Stellaria media*), cocklebur (*Xanthium*
pensylvanicum), corn (*Zea mays*), cotton (*Gossypium*
10 *hirsutum*), crabgrass (*Digitaria spp.*), giant foxtail
(*Setaria faberii*), lambsquarters (*Chenopodium album*),
morningglory (*Ipomoea hederacea*), rape (*Brassica*
napus), rice (*Oryza sativa*), sorghum (*Sorghum*
bicolor), soybean (*Glycine max*), sugar beet (*Beta*
15 *vulgaris*), velvetleaf (*Abutilon theophrasti*), wheat
(*Triticum aestivum*), wild buckwheat (*Polygonum*
convolvulus), and wild oat (*Avena fatua*) and purple
nutsedge (*Cyperus rotundus*) tubers were planted and
treated preemergence with test chemicals dissolved in
20 a non-phytotoxic solvent. At the same time, these
crop and weed species were also treated with
postemergence applications of test chemicals. Plants
ranged in height from two to eighteen cm (one to four
leaf stage) for postemergence treatments. Treated
25 plants and controls were maintained in a greenhouse
for approximately twelve to sixteen days, after which
all species were compared to controls and visually
evaluated. Plant response ratings, summarized in
Table B, are based on a scale of 0 to 10 where 0 is
30 no effect and 10 is complete control. A dash (-)
response means no test result.

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Table B

	COMPOUND 5	COMPOUND
	Rate (2000 g/ha) 9	Rate (2000 g/ha) 9
	POSTEMERGENCE	PREEMERGENCE
	Barley 7	Barley 7
10	Barnyardgrass 2	Barnyardgrass 6
	Bedstraw -	Bedstraw 9
	Blackgrass 6	Blackgrass 8
	Cheatgrass 6	Cheatgrass 9
	Chickweed 7	Chickweed 9
15	Cocklebur 2	Cocklebur 3
	Corn 4	Corn 2
	Cotton 9	Cotton 8
	Crabgrass 2	Crabgrass -
	Giant foxtail 3	Giant foxtail 2
20	Lambsquarters 6	Lambsquarters 9
	Morningglory 4	Morningglory 2
	Nutsedge 9	Nutsedge -
	Rape 5	Rape 7
	Rice 4	Rice 8
25	Sorghum 9	Sorghum 7
	Soybean 9	Soybean 9
	Sugar beet 9	Sugar beet 9
	Velvetleaf 9	Velvetleaf 8
	Wheat 2	Wheat 2
30	Wild Buckwheat 8	Wild Buckwheat 9
	Wild Oat 2	Wild Oat 7

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Table B

	5	Rate (400 g/ha)	COMPOUND			Rate (400 g/ha)	COMPOUND		
			4	5	9		4	5	9
POSTEMERGENCE									
		Barley	3	3	2	Barley	0	0	0
10	Barnyardgrass	2	0	0		Barnyardgrass	0	0	2
	Bedstraw	9	9	4		Bedstraw	6	8	7
	Blackgrass	0	2	4		Blackgrass	5	4	4
	Cheatgrass	2	5	2		Cheatgrass	0	4	6
	Chickweed	6	8	6		Chickweed	6	5	9
	Cocklebur	1	6	3		Cocklebur	7	2	2
15	Corn	0	0	2		Corn	0	0	-
	Cotton	4	8	6		Cotton	0	5	8
	Crabgrass	0	2	2		Crabgrass	2	0	-
	Giant foxtail	0	3	2		Giant foxtail	2	2	2
	Lambsquarters	7	8	5		Lambsquarters	10	10	-
	Morningglory	1	6	3		Morningglory	0	2	1
20	Nutsedge	5	9	8		Nutsedge	0	9	-
	Rape	3	5	2		Rape	3	3	0
	Rice	0	5	2		Rice	0	3	2
	Sorghum	3	7	8		Sorghum	0	2	5
	Soybean	9	9	9		Soybean	3	9	8
	Sugar beet	9	9	9		Sugar beet	4	6	9
25	Velvetleaf	8	9	7		Velvetleaf	3	8	8
	Wheat	0	0	0		Wheat	0	0	0
	Wild Buckwheat	9	8	7		Wild Buckwheat	6	3	6
	Wild Oat	0	1	2		Wild Oat	0	2	2

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Table B

		COMPOUND		COMPOUND			
	5						
		Rate (100 g/ha)	4	5	Rate (100 g/ha)		
		POSTEMERGENCE			PREEMERGENCE		
		Barley	0	0	Barley	0	0
	10	Barnyardgrass	0	0	Barnyardgrass	0	0
		Bedstraw	9	7	Bedstraw	2	7
		Blackgrass	0	0	Blackgrass	3	2
		Cheatgrass	0	2	Cheatgrass	0	2
		Chickweed	4	5	Chickweed	5	4
	15	Cocklebur	0	2	Cocklebur	5	-
		Corn	0	0	Corn	0	0
		Cotton	2	7	Cotton	0	0
		Crabgrass	0	0	Crabgrass	0	0
		Giant foxtail	0	0	Giant foxtail	2	2
	20	Lambsquarters	5	7	Lambsquarters	10	0
		Morningglory	1	5	Morningglory	0	0
		Nutsedge	2	9	Nutsedge	0	5
		Rape	0	2	Rape	0	2
		Rice	0	3	Rice	0	0
	25	Sorghum	0	4	Sorghum	0	0
		Soybean	9	9	Soybean	2	8
		Sugar beet	8	8	Sugar beet	0	1
		Velvetleaf	5	8	Velvetleaf	2	0
		Wheat	0	0	Wheat	0	0
	30	Wild Buckwheat	8	8	Wild Buckwheat	2	4
		Wild Oat	0	0	Wild Oat	0	0

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Table B

		COMPOUND	
5	Rate (2000 g/ha)	10	16
	POSTEMERGENCE		
	Barley	9	6
	Barnyardgrass	9	6
	Bedstraw	7	9
	Blackgrass	9	8
10	Cheatgrass	9	8
	Chickweed	9	-
	Cocklebur	9	-
	Corn	6	2
	Cotton	9	9
	Crabgrass	7	2
	Giant foxtail	8	8
15	Lambsquarters	9	9
	Morningglory	8	9
	Nutsedge	9	8
	Rape	10	9
	Rice	9	9
	Sorghum	9	9
	Soybean	9	9
	Sugar beet	10	10
20	Velvetleaf	9	9
	Wheat	6	6
	Wild buckwheat	10	9
	Wild oat	5	3

Table B COMPOUND

25	Rate (2000 g/ha)	10	16
	PREEMERGENCE		
	Barley	9	0
	Barnyardgrass	8	5
	Bedstraw	7	9
	Blackgrass	9	6
	Cheatgrass	8	8
	Chickweed	10	9
30	Cocklebur	-	-
	Corn	3	1
	Cotton	7	6
	Crabgrass	5	2
	Giant foxtail	7	1
	Lambsquarters	9	9
	Morningglory	5	2
	Nutsedge	5	7
35	Rape	8	9
	Rice	7	9
	Sorghum	8	4
	Soybean	9	9
	Sugar beet	9	9

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Table B COMPOUND

5	Velvetleaf	7	6
	Wheat	7	4
	Wild buckwheat	7	9
	Wild oat	6	0

Table B COMPOUND

10	Rate (1000 g/ha)	19
POSTEMERGENCE		
	Barley	8
	Barnyardgrass	9
	Bedstraw	8
	Blackgrass	9
	Cheatgrass	9
	Chickweed	10
	Corn	9
15	Cotton	5
	Crabgrass	8
	Giant foxtail	8
	Lambsquarters	9
	Morningglory	9
	Nutsedge	-
	Rape	9
20	Rice	9
	Sorghum	9
	Soybean	6
	Sugar beet	10
	Velvetleaf	5
	Wheat	8
	Wild buckwheat	9
	Wild oat	9

25	Table B	COMPOUND
	Rate (1000 g/ha)	19
PREEMERGENCE		
	Barley	7
	Barnyardgrass	9
	Bedstraw	9
30	Blackgrass	9
	Cheatgrass	8
	Chickweed	9
	Corn	9
	Cotton	8
	Crabgrass	9
	Giant foxtail	9
	Lambsquarters	9
35	Morningglory	5
	Nutsedge	9
	Rape	6
	Rice	9
	Sorghum	9

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Table B COMPOUND

	Rate (1000 g/ha)	19
	Soybean	8
5	Sugar beet	9
	Velvetleaf	2
	Wheat	9
	Wild buckwheat	8
	Wild oat	9

Table B COMPOUND

10	Rate (400 g/ha)	10	11	16	18
POSTEMERGENCE					
	Barley	9	0	6	0
	Barnyardgrass	9	0	3	-
	Bedstraw	7	3	8	2
	Blackgrass	9	0	5	1
	Cheatgrass	8	0	8	0
15	Chickweed	9	7	9	3
	Cocklebur	9	-	-	-
	Corn	4	0	0	1
	Cotton	9	5	6	0
	Crabgrass	4	0	0	0
	Giant foxtail	7	0	7	0
	Lambsquarters	8	8	8	0
20	Morningglory	7	3	9	0
	Nutsedge	-	6	7	0
	Rape	9	2	9	0
	Rice	8	2	7	0
	Sorghum	9	0	8	3
	Soybean	9	9	9	0
	Sugar beet	10	9	9	3
	Velvetleaf	9	5	9	0
25	Wheat	5	0	2	2
	Wild buckwheat	9	8	8	0
	Wild oat	3	0	0	0

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Table B COMPOUND

	5 Rate (400 g/ha)	10	11	16	18
PREEMERGENCE					
	Barley	8	0	0	0
	Barnyardgrass	7	0	3	3
	Bedstraw	2	5	3	0
10	Blackgrass	8	4	0	0
	Cheatgrass	8	3	8	5
	Chickweed	0	6	4	0
	Cocklebur	-	-	-	-
	Corn	2	0	0	0
15	Cotton	6	4	0	0
	Crabgrass	2	0	0	2
	Giant foxtail	3	0	1	2
	Lambsquarters	9	8	9	0
	Morningglory	2	0	0	0
20	Nutsedge	0	0	0	-
	Rape	7	2	3	0
	Rice	6	0	7	2
	Sorghum	7	1	0	9
	Soybean	9	8	6	0
25	Sugar beet	8	2	9	2
	Velvetleaf	3	1	3	1
	Wheat	5	0	2	0
	Wild buckwheat	2	4	3	0
	Wild oat	4	2	0	2

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Table B COMPOUND

5	Rate (200 g/ha)	19
POSTEMERGENCE		
	Barley	5
	Barnyardgrass	8
	Bedstraw	6
10	Blackgrass	7
	Cheatgrass	7
	Chickweed	7
	Cocklebur	-
	Corn	8
15	Cotton	0
	Crabgrass	6
	Giant foxtail	4
	Lambsquarters	9
	Morningglory	1
20	Nutsedge	6
	Rape	7
	Rice	8
	Sorghum	7
	Soybean	4
25	Sugar beet	8
	Velvetleaf	2
	Wheat	2
	Wild buckwheat	7
	Wild Oat	5

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Table B COMPOUND

5	Rate (200 g/ha)	12	19
PREEMERGENCE			
	Barley	9	3
	Barnyardgrass	7	8
	Bedstraw	9	9
10	Blackgrass	3	8
	Cheatgrass	9	8
	Chickweed	10	9
	Cocklebur	-	-
	Corn	1	5
15	Cotton	8	1
	Crabgrass	2	9
	Giant foxtail	2	8
	Lambsquarters	9	10
	Morningglory	9	0
20	Nutsedge	7	5
	Rape	9	6
	Rice	8	6
	Sorghum	8	5
	Soybean	9	2
25	Sugar beet	9	9
	Velvetleaf	9	0
	Wheat	8	7
	Wild buckwheat	9	3
	Wild oat	8	8

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Table B COMPOUND

5	Rate (100 g/ha)	11 18
POSTEMERGENCE		
	Barley	0 0
	Barnyardgrass	0 -
	Bedstraw	2 0
10	Blackgrass	0 0
	Cheatgrass	0 0
	Chickweed	0 0
	Cocklebur	- -
	Corn	0 0
15	Cotton	2 0
	Crabgrass	0 0
	Giant foxtail	0 0
	Lambsquarters	4 0
	Morningglory	1 0
20	Nutsedge	0 0
	Rape	0 0
	Rice	0 0
	Sorghum	0 2
	Soybean	8 0
25	Sugar beet	8 3
	Velvetleaf	0 0
	Wheat	0 0
	Wild buckwheat	7 0
	Wild oat	0 0

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Table B COMPOUND

5	Rate (100 g/ha)	11 18
PREEMERGENCE		
	Barley	0 0
	Barnyardgrass	0 0
	Bedstraw	0 0
10	Blackgrass	2 0
	Cheatgrass	0 2
	Chickweed	0 0
	Cocklebur	- -
	Corn	0 0
15	Cotton	0 0
	Crabgrass	0 0
	Giant foxtail	0 0
	Lambsquarters	0 0
	Morningglory	0 0
20	Nutsedge	0 0
	Rape	0 0
	Rice	0 0
	Sorghum	0 3
	Soybean	6 0
25	Sugar beet	0 2
	Velvetleaf	0 0
	Wheat	0 0
	Wild buckwheat	0 0
	Wild oat	0 0

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TEST C

Seeds of barley (Hordeum vulgare),
5 barnyardgrass (Echinochloa crus-galli), blackgrass
(Alopecurus myosuroides), chickweed (Stellaria
media), cocklebur (Xanthium pensylvanicum), corn (Zea
mays), cotton (Gossypium hirsutum), crabgrass
(Digitaria spp.), downy brome (Bromus tectorum),
10 giant foxtail (Setaria faberii), green foxtail
(Setaria viridis), jimsonweed (Datura stramonium),
johnsongrass (Sorghum halepense), lambsquarters
(Chenopodium album), morningglory (Ipomoea spp.),
rape (Brassica napus), rice (Oryza sativa), sicklepod
15 (Cassia obtusifolia), soybean (Glycine max), sugar
beet (Beta vulgaris), teaweed (Sida spinosa),
velvetleaf (Abutilon theophrasti), wheat (Triticum
aestivum), wild buckwheat (Polygonum convolvulus),
and wild oat (Avena fatua) and purple nutsedge
20 (Cyperus rotundus) tubers were planted and treated
preemergence with test chemicals dissolved in a
non-phytotoxic solvent. At the same time, these crop
and weed species were also treated with postemergence
applications of test chemicals. Plants ranged in
25 height from two to eighteen cm (two to three leaf
stage) for postemergence treatments. Treated plants
and controls were maintained in a greenhouse for
approximately eighteen to twenty-four days, after
which all species were compared to controls and
30 visually evaluated. Plant response ratings,
summarized in Table C, are reported on a 0 to 10
scale where 0 is no effect and 10 is complete
control. A dash (-) response means no test result.

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Table C

		COMPOUND		COMPOUND	
5					
	Rate (250 g/ha)	1		Rate (250 g/ha) 1	
	POSTEMERGENCE			PREEMERGENCE	
	Barley	8		Barley	7
10	Barnyardgrass	9		Barnyardgrass	10
	Blackgrass	7		Blackgrass	7
	Chickweed	10		Chickweed	9
	Cocklebur	9		Cocklebur	10
	Corn	10		Corn	10
15	Cotton	3		Cotton	4
	Crabgrass	7		Crabgrass	8
	Downy brome	7		Downy brome	8
	Giant foxtail	9		Giant foxtail	7
	Green foxtail	7		Green foxtail	8
20	Jimsonweed	9		Jimsonweed	8
	Johnsongrass	9		Johnsongrass	8
	Lambsquarters	10		Lambsquarters	-
	Morningglory	4		Morningglory	8
	Nutsedge	9		Nutsedge	10
25	Rape	9		Rape	10
	Rice	9		Rice	10
	Sicklepod	8		Sicklepod	8
	Soybean	9		Soybean	8
	Sugar beet	10		Sugar beet	10
30	Teaweed	9		Teaweed	9
	Velvetleaf	10		Velvetleaf	9
	Wheat	6		Wheat	6
	Wild buckwheat	10		Wild buckwheat	9
	Wild oat	7		Wild oat	7

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Table C

		COMPOUND		COMPOUND
5				
	Rate (62 g/ha)	1 6	Rate (62 g/ha)	1 6
	POSTEMERGENCE		PREEMERGENCE	
	Barley	5 5	Barley	5 4
10	Barnyardgrass	9 8	Barnyardgrass	7 8
	Blackgrass	7 3	Blackgrass	5 3
	Chickweed	10 10	Chickweed	7 2
	Cocklebur	7 8	Cocklebur	10 6
	Corn	10 3	Corn	6 2
15	Cotton	2 9	Cotton	3 9
	Crabgrass	6 2	Crabgrass	7 0
	Downy brome	5 7	Downy brome	7 9
	Giant foxtail	8 4	Giant foxtail	3 3
	Green foxtail	4 4	Green foxtail	6 0
20	Jimsonweed	9 8	Jimsonweed	7 9
	Johnsongrass	7 8	Johnsongrass	7 9
	Lambsquarters	- 10	Lambsquarters	- 10
	Morningglory	0 9	Morningglory	6 9
	Nutsedge	9 3	Nutsedge	7 9
25	Rape	8 10	Rape	8 4
	Rice	9 7	Rice	10 2
	Sicklepod	8 6	Sicklepod	7 9
	Soybean	8 9	Soybean	6 9
	Sugar beet	10 10	Sugar beet	10 9
30	Teaweed	8 9	Teaweed	9 9
	Velvetleaf	10 9	Velvetleaf	9 3
	Wheat	4 3	Wheat	4 4
	Wild buckwheat	9 9	Wild buckwheat	8 9
	Wild oat	4 4	Wild oat	5 4

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Table C

		COMPOUND		COMPOUND	
	5				
		Rate (16 g/ha)	1 6	Rate (16 g/ha)	1 6
		POSTEMERGENCE		PREEMERGENCE	
		Barley	4 2	Barley	3 2
	10	Barnyardgrass	4 4	Barnyardgrass	6 4
		Blackgrass	6 0	Blackgrass	4 0
		Chickweed	6 8	Chickweed	5 0
		Cocklebur	2 5	Cocklebur	9 3
		Corn	9 3	Corn	4 0
	15	Cotton	0 8	Cotton	3 9
		Crabgrass	3 0	Crabgrass	5 0
		Downy brome	4 5	Downy brome	6 7
		Giant foxtail	4 2	Giant foxtail	0 0
		Green foxtail	2 2	Green foxtail	3 0
	20	Jimsonweed	7 5	Jimsonweed	6 9
		Johnsongrass	6 7	Johnsongrass	6 8
		Lambsquarters	9 10	Lambsquarters	- 3
		Morningglory	0 9	Morningglory	6 9
		Nutsedge	4 2	Nutsedge	5 3
	25	Rape	6 9	Rape	8 0
		Rice	8 5	Rice	8 0
		Sicklepod	4 5	Sicklepod	6 6
		Soybean	6 8	Soybean	4 9
		Sugar beet	10 9	Sugar beet	9 8
	30	Teaweed	6 7	Teaweed	9 9
		Velvetleaf	8 9	Velvetleaf	9 0
		Wheat	2 2	Wheat	3 2
		Wild buckwheat	9 8	Wild buckwheat	7 8
		Wild oat	2 2	Wild oat	3 2

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Table C

		COMPOUND		COMPOUND
5				
	Rate (4 g/ha)	1 6	Rate (4 g/ha)	1 6
	POSTEMERGENCE		PREEMERGENCE	
10	Barley	2 0	Barley	0 0
	Barnyardgrass	2 0	Barnyardgrass	3 3
	Blackgrass	4 0	Blackgrass	4 0
	Chickweed	4 7	Chickweed	3 0
	Cocklebur	0 5	Cocklebur	7 0
	Corn	5 0	Corn	2 0
15	Cotton	0 8	Cotton	0 -
	Crabgrass	0 0	Crabgrass	3 0
	Downy brome	3 3	Downy brome	4 2
	Giant foxtail	1 0	Giant foxtail	0 0
	Green foxtail	2 0	Green foxtail	3 0
20	Jimsonweed	5 5	Jimsonweed	3 9
	Johnsongrass	3 4	Johnsongrass	4 5
	Lambsquarters	8 8	Lambsquarters	- 0
	Morningglory	0 8	Morningglory	- 5
	Nutsedge	4 0	Nutsedge	3 0
25	Rape	5 7	Rape	7 0
	Rice	7 3	Rice	4 0
	Sicklepod	4 4	Sicklepod	5 4
	Soybean	4 6	Soybean	3 8
	Sugar beet	10 9	Sugar beet	8 3
30	Teaweed	4 5	Teaweed	8 8
	Velvetleaf	7 7	Velvetleaf	8 0
	Wheat	0 0	Wheat	0 0
	Wild buckwheat	7 6	Wild buckwheat	6 2
	Wild oat	0 0	Wild oat	0 0

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TEST D

The compound evaluated in this test was
5 formulated in a non-phytotoxic solvent and applied to
the soil surface before plant seedlings emerged
(preemergence application), to water that covered the
soil surface (paddy application), and to plants that
were in the one-to-four leaf stage (postemergence
10 application). A sandy loam soil was used for the
preemergence and postemergence tests, while a silt
loam soil was used in the paddy test. Water depth
was approximately 2.5 cm for the paddy test and was
maintained at this level for the duration of the test.

15 Plant species in the preemergence and
postemergence tests consisted of barley (Hordeum
vulgare), bedstraw (Galium aparine), blackgrass
(Alopecurus myosuroides), chickweed (Stellaria
media), corn (Zea mays), cotton (Gossypium hirsutum),
20 crabgrass (Digitaria sanguinalis), downy brome
(Bromus tectorum), giant foxtail (Setaria faberii),
lambsquarters (Chenopodium album), morningglory
(Ipomoea hederacea), pigweed (Amaranthus
retroflexus), rape (Brassica napus), ryegrass (Lolium
25 multiflorum), sorghum (Sorghum bicolor), soybean
(Glycine max), speedwell (Veronica persica), sugar
beet (Beta vulgaris), velvetleaf (Abutilon
theophrasti), wheat (Triticum aestivum), wild
buckwheat (Polygonum convolvulus), and wild oat
30 (Avena fatua). All plant species were planted one day
before application of the compound for the
preemergence portion of this test. Plantings of
these species were adjusted to produce plants of
appropriate size for the postemergence portion of the
test. Plant species in the paddy test consisted of
35 barnyardgrass (Echinochloa crus-galli), rice (Oryza
sativa), and umbrella sedge (Cyperus difformis).

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All plant species were grown using normal greenhouse practices. Visual evaluations of injury expressed on treated plants, when compared to untreated controls, were recorded approximately fourteen to twenty-one days after application of the test compound. Plant response ratings, summarized in Table D, were recorded on a zero to ten scale where zero is no injury and ten is plant death. A dash (-) response means no test result.

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Table D

	COMPOUND	COMPOUND
5		
	Rate (500 g/ha) 2	Rate (500 g/ha) 2
	POSTEMERGENCE	PADDY
	Barley 10	Barnyardgrass 8
10	Bedstraw 10	Rice 8
	Blackgrass 10	Umbrella sedge 9
	Chickweed 10	
	Corn 10	
	Cotton 6	
15	Crabgrass 4	
	Downy brome 9	
	Giant foxtail 9	
	Lambsquarters 10	
	Morningglory 6	
20	Pigweed 10	
	Rape 9	
	Ryegrass 7	
	Sorghum 7	
	Soybean 10	
25	Speedwell 10	
	Sugar beet 10	
	Velvetleaf 10	
	Wheat 8	
	Wild buckwheat 10	
30	Wild oat 8	

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Table D

	COMPOUND	COMPOUND
5	Rate (500 g/ha)	2
	PREEMERGENCE	POSTEMERGENCE
10	Barley	8
	Bedstraw	9
	Blackgrass	7
	Chickweed	9
	Corn	10
	Cotton	5
15	Crabgrass	8
	Downy brome	8
	Giant foxtail	9
	Lambsquarters	9
	Morningglory	8
20	Pigweed	10
	Rape	9
	Ryegrass	9
	Sorghum	10
	Soybean	9
25	Speedwell	9
	Sugar beet	9
	Velvetleaf	9
	Wheat	8
	Wild buckwheat	9
30	Wild oat	7
	Rate (250 g/ha)	2
	POSTEMERGENCE	
	Barley	10
	Bedstraw	10
	Blackgrass	10
	Chickweed	10
	Corn	10
	Cotton	4
	Crabgrass	3
	Downy brome	9
	Giant foxtail	9
	Lambsquarters	10
	Morningglory	4
	Pigweed	10
	Rape	8
	Ryegrass	-
	Sorghum	7
	Soybean	10
	Speedwell	10
	Sugar beet	10
	Velvetleaf	10
	Wheat	8
	Wild buckwheat	10
	Wild oat	6

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Table D

	COMPOUND	COMPOUND
5	Rate (250 g/ha) 2	Rate (250 g/ha) 2
	PADDY	PREEMERGENCE
	Barnyardgrass 7	Barley 8
10	Rice 8	Bedstraw 9
	Umbrella sedge 9	Blackgrass 6
		Chickweed 9
		Corn 9
		Cotton 4
15		Crabgrass 8
		Downy brome 8
		Giant foxtail 8
		Lambsquarters 9
		Morningglory 7
20		Pigweed 10
		Rape 9
		Ryegrass 8
		Sorghum 10
		Soybean 9
25		Speedwell 9
		Sugar beet 9
		Velvetleaf 9
		Wheat 7
		Wild buckwheat 9
30		Wild oat 7

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Table D

	COMPOUND		COMPOUND	
5				
	Rate (125 g/ha)	2	Rate (125 g/ha)	2
	POSTEMERGENCE		PADDY	
	Barley	9	Barnyardgrass	7
10	Bedstraw	10	Rice	8
	Blackgrass	9	Umbrella sedge	9
	Chickweed	10		
	Corn	7		
	Cotton	4		
15	Crabgrass	0		
	Downy brome	9		
	Giant foxtail	7		
	Lambsquarters	10		
	Morningglory	2		
20	Pigweed	10		
	Rape	6		
	Ryegrass	7		
	Sorghum	6		
	Soybean	10		
25	Speedwell	10		
	Sugar beet	10		
	Velvetleaf	10		
	Wheat	7		
	Wild buckwheat	10		
30	Wild oat	5		

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Table D

		COMPOUND		COMPOUND	
	5				
		Rate (125 g/ha)	2	Rate (62 g/ha)	2
		PREEMERGENCE		POSTEMERGENCE	
		Barley	7	Barley	8
	10	Bedstraw	9	Bedstraw	10
		Blackgrass	6	Blackgrass	9
		Chickweed	9	Chickweed	10
		Corn	9	Corn	6
		Cotton	2	Cotton	2
	15	Crabgrass	7	Crabgrass	0
		Downy brome	7	Downy brome	8
		Giant foxtail	7	Giant foxtail	6
		Lambsquarters	9	Lambsquarters	10
		Morningglory	7	Morningglory	0
	20	Pigweed	10	Pigweed	10
		Rape	8	Rape	5
		Ryegrass	8	Ryegrass	6
		Sorghum	10	Sorghum	6
		Soybean	8	Soybean	10
	25	Speedwell	9	Speedwell	10
		Sugar beet	9	Sugar beet	9
		Velvetleaf	8	Velvetleaf	10
		Wheat	7	Wheat	6
		Wild buckwheat	9	Wild buckwheat	10
	30	Wild oat	6	Wild oat	4

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Table D

	COMPOUND	COMPOUND
5		
	Rate (62 g/ha) 2	Rate (62 g/ha) 2
	PADDY	PREEMERGENCE
	Barnyardgrass 7	Barley 6
10	Rice 8	Bedstraw 9
	Umbrella sedge 8	Blackgrass 5
		Chickweed 8
		Corn 8
		Cotton 0
15		Crabgrass 5
		Downy brome 7
		Giant foxtail 6
		Lambsquarters 9
		Morningglory 7
20		Pigweed 10
		Rape 8
		Ryegrass 7
		Sorghum 9
		Soybean 8
25		Speedwell 9
		Sugar beet 8
		Velvetleaf 8
		Wheat 4
		Wild buckwheat 9
30		Wild oat 5

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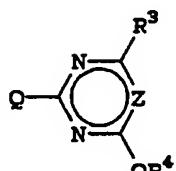
CLAIMS

5 What is claimed:

1. A compound of the formula:

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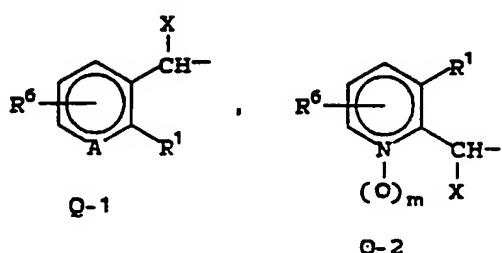
20

wherein

Q is

25

30



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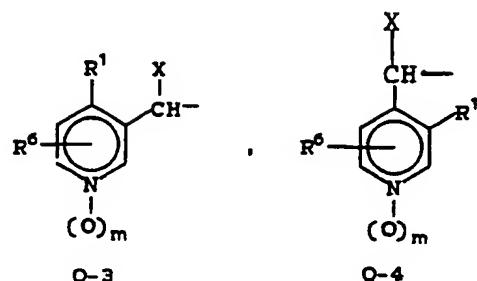
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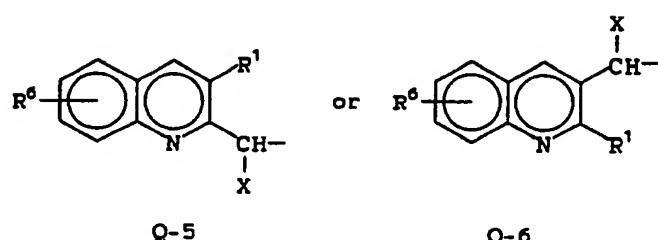
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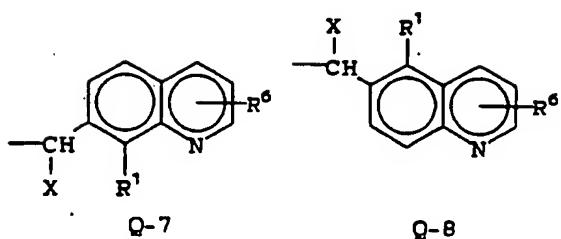
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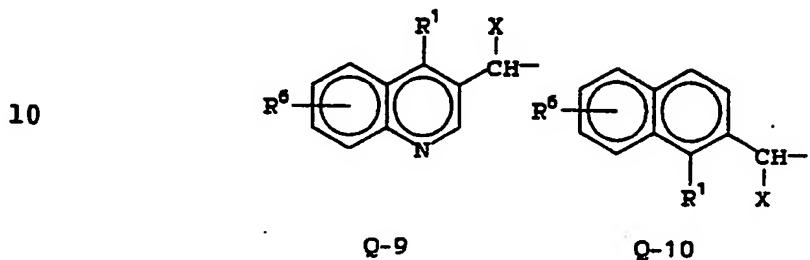
SUBSTITUTE SHEET

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A is CR², N or N-O;

X is H, F, Cl, CH₃, OH, C(O)NR¹²R¹³, CO₂R¹⁴ or CN;

R¹ is H, CHO, C(OCH₃)₂H, CO₂R⁵ or C(O)SR¹¹;

R² is H, F, Cl, C₁-C₂ alkyl, C₁-C₂-alkoxy, C₂-C₃ alkynyl, C₂-C₃ alkenyl, S(O)_nC₁-C₂ alkyl, NO₂, phenoxy, C₂-C₄ alkylcarbonyl, C(OCH₃)₂CH₃, or C(SCH₃)₂CH₃;

R³ is C₁-C₂ alkyl, C₁-C₂ alkoxy, OCF₂H or Cl;

R⁴ is C₁-C₂ alkyl;

R⁵ is H; M; C₁-C₃ alkyl; C₂-C₃ haloalkyl; allyl; propargyl; benzyl optionally substituted with halogen, C₁-C₂ alkyl, C₁-C₂ alkoxy, CF₃, NO₂, SCH₃, S(O)CH₃, or S(O)₂CH₃; C₂-C₄ alkoxyalkyl; N=CR⁷R⁸; or CHR⁹S(O)_nR¹⁰;

R⁶ is H, F, Cl, CH₃, OCH₃ or S(O)_nCH₃;

R⁷ is Cl, C₁-C₂ alkyl or SCH₃;

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R⁸ is C₁-C₂ alkyl, CO₂(C₁-C₂ alkyl) or
C(O)N(CH₃)₂;

5 R⁹ is H or CH₃;

R¹⁰ is C₁-C₃ alkyl or phenyl optionally
substituted with halogen, CH₃, OCH₃ or NO₂;

R¹¹ is C₁-C₂ alkyl or benzyl;

R¹² is H or CH₃;

10 R¹³ is H or CH₃;

R¹⁴ is H, C₁-C₃ alkyl, C₂-C₅ haloalkyl, C₃-C₅
alkenyl, C₃-C₅ alkynyl, C₂-C₅ alkoxyalkyl or benzyl
optionally substituted with CH₃, OCH₃, SCH₃, halogen,
NO₂ or CF₃;

15 m is 0 or 1;

n is 0, 1 or 2;

M is a alkali metal atom or an alkaline earth
metal atom, an ammonium group or an alkylammonium
group; and

20 Z is CH or N.

and their agriculturally suitable salts;
provided that:

(a) when R¹ is H, then X is CO₂R¹⁴;

(b) when X is CO₂R¹⁴, then R¹ is H; and.

25 (c) when Z is N, then R³ is C₁-C₂ alkyl or
C₁-C₂ alkoxy.

2. The compounds of Claim 1 wherein Q is Q-1
or Q-2.

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3. The compounds of Claim 2 wherein

R² is H, F, Cl, CH₃, SCH₃, OCH₃ or
OCH₂CH₃.

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4. The compounds of Claim 3 wherein

5 R⁶ is H;

 Z is CH;

 R³ is OCH₃;

 R⁴ is CH₃; and

 X is H.

10

5. The compounds of Claim 3 wherein

R⁶ is H or 3-F;

Z is CH;

R³ is OCH₃;

R⁴ is CH₃;

15

X is CO₂R¹⁴; and

R¹⁴ is C₁-C₃ alkyl, allyl, propargyl or benzyl.

6. The compound of Claim 3 which is

20 2-[cyano(4,6-dimethoxy-2-pyrimidinyl)methyl]-benzoic acid.

7. The compounds of Claim 4 wherein

Q is Q-1;

25

R¹ is CO₂R⁵; and

R⁵ is H or M.

8. The compounds of Claim 4 wherein

Q is Q-2;

30

R¹ is CO₂R⁵; and

R⁵ is H or M.

9. The compound of Claim 5 which is ethyl
4,6-dimethoxy-alpha-phenyl-2-pyrimidineacetate.

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10. The compound of Claim 7 which is
2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl-
5 benzoic acid.

11. The compound of Claim 7 which is
2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-6-methyl
benzoic acid, sodium salt.

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12. The compound of Claim 7 which is
2-[(4,6-dimethoxy-2-pyrimidinyl)methyl]-3-pyridine
carboxylic acid.

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13. A composition suitable for controlling
the growth of undesired vegetation which comprises an
effective amount of a compound of Claim 1 and at
least one of the following: surfactant, solid or
liquid diluent.

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14. A composition suitable for controlling
the growth of undesired vegetation which compresses
an effective amount of a compound of Claim 2 and at
least one of the following: surfactant, solid or
25 liquid diluent.

15. A composition suitable for controlling
the growth of undesired vegetation which compresses
an effective amount of a compound of Claim 3 and at
30 least one of the following: surfactant, solid or
liquid diluent.

16. A composition suitable for controlling
the growth of undesired vegetation which compresses
35 an effective amount of a compound of Claim 4 and at

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least one of the following: surfactant, solid or liquid diluent.

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17. A composition suitable for controlling the growth of undesired vegetation which compresses an effective amount of a compound of Claim 5 and at least one of the following: surfactant, solid or liquid diluent.

10

18. A composition suitable for controlling the growth of undesired vegetation which compresses an effective amount of a compound of Claim 6 and at least one of the following: surfactant, solid or liquid diluent.

15

19. A composition suitable for controlling the growth of undesired vegetation which compresses an effective amount of a compound of Claim 7 and at least one of the following: surfactant, solid or liquid diluent.

20

20. A composition suitable for controlling the growth of undesired vegetation which compresses an effective amount of a compound of Claim 8 and at least one of the following: surfactant, solid or liquid diluent.

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21. A composition suitable for controlling the growth of undesired vegetation which compresses an effective amount of a compound of Claim 9 and at least one of the following: surfactant, solid or liquid diluent.

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22. A composition suitable for controlling
the growth of undesired vegetation which compresses
5 an effective amount of a compound of Claim 10 and at
least one of the following: surfactant, solid or
liquid diluent.

23. A composition suitable for controlling
10 the growth of undesired vegetation which compresses
an effective amount of a compound of Claim 11 and at
least one of the following: surfactant, solid or
liquid diluent.

15 24. A composition suitable for controlling
the growth of undesired vegetation which compresses
an effective amount of a compound of Claim 12 and at
least one of the following: surfactant, solid or
liquid diluent.

20 25. A method for controlling the growth of
undesired vegetation which compresses applying to the
locus to be protected an effective amount of a
compound of Claim 1.

25 26. A method for controlling the growth of
undesired vegetation which compresses applying to the
locus to be protected an effective amount of a
compound of Claim 2.

30 27. A method for controlling the growth of
undesired vegetation which compresses applying to the
locus to be protected an effective amount of a
compound of Claim 3.

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28. A method for controlling the growth of
undesired vegetation which compresses applying to the
5 locus to be protected an effective amount of a
compound of Claim 4.

29. A method for controlling the growth of
undesired vegetation which compresses applying to the
10 locus to be protected an effective amount of a
compound of Claim 5.

30. A method for controlling the growth of
undesired vegetation which compresses applying to the
15 locus to be protected an effective amount of a
compound of Claim 6.

31. A method for controlling the growth of
undesired vegetation which compresses applying to the
20 locus to be protected an effective amount of a
compound of Claim 7.

32. A method for controlling the growth of
undesired vegetation which compresses applying to the
25 locus to be protected an effective amount of a
compound of Claim 8.

33. A method for controlling the growth of
undesired vegetation which compresses applying to the
30 locus to be protected an effective amount of a
compound of Claim 9.

34. A method for controlling the growth of
undesired vegetation which compresses applying to the
35 locus to be protected an effective amount of a
compound of Claim 10.

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35. A method for controlling the growth of
undesired vegetation which compresses applying to the
5 locus to be protected an effective amount of a
compound of Claim 11.

36. A method for controlling the growth of
undesired vegetation which compresses applying to the
10 locus to be protected an effective amount of a
compound of Claim 12.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 90/07417

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC⁵ C 07 D 239/52, C 07 D 251/20, C 07 D 401/06, A 01 N 43/54,
IPC : A 01 N 43/66

II. FIELDS SEARCHED

Minimum Documentation Searched †

Classification System	Classification Symbols
IPC ⁵	C 07 D 239/00, C 07 D 251/00, C 07 D 406/00, A 01 N

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT*

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages †‡	Relevant to Claim No. †§
A	GB, A, 1 585 950 (ICI) 11 March 1981 (11.03.81), see claims 1,12, 14; compounds No. 106-113. --	1,13, 25
P,A	EP, A2, 0 360 163 (BASF) 28 March 1990 (28.03.90), see claims 1,5,8 (cited in the application). --	1,13, 25
A	DE, A1, 2 656 183 (AKZO) 23 June 1977 (23.06.77), see claim 2. ----	1

- * Special categories of cited documents: †
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the International filing date but later than the priority date claimed

- "T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "Z" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
03 April 1991	17 MAY 1991
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer MISS D.S. KOWALCZYK

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

SA44312

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
GB-A - 1585950	11-03-81	AU-A1-27169/77 AU-B2- 508770 BR-A - 7704988 CA-A1- 1077038 DE-A1- 2734827 FR-A1- 2360581 FR-B1- 2360581 GB-A - 1585950 IT-A - 1085431 JP-A2-53018589 NL-A - 7708516 NZ-A - 184678 NZ-A - 188895 ZA-A - 7704294	25-01-79 03-04-80 28-03-78 06-05-80 09-02-78 03-03-78 15-04-83 11-03-81 28-05-85 20-02-78 06-02-78 01-11-79 01-11-79 28-06-78
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